evoted to
EXTILE
HEMISTRY
LEACHING
DYEING
RINTING
INISHING

GUST 14, 1944
LUME 33, No. 17

AMERICAN DYESTUFF REPORTER

SKILLFUL BLENDING

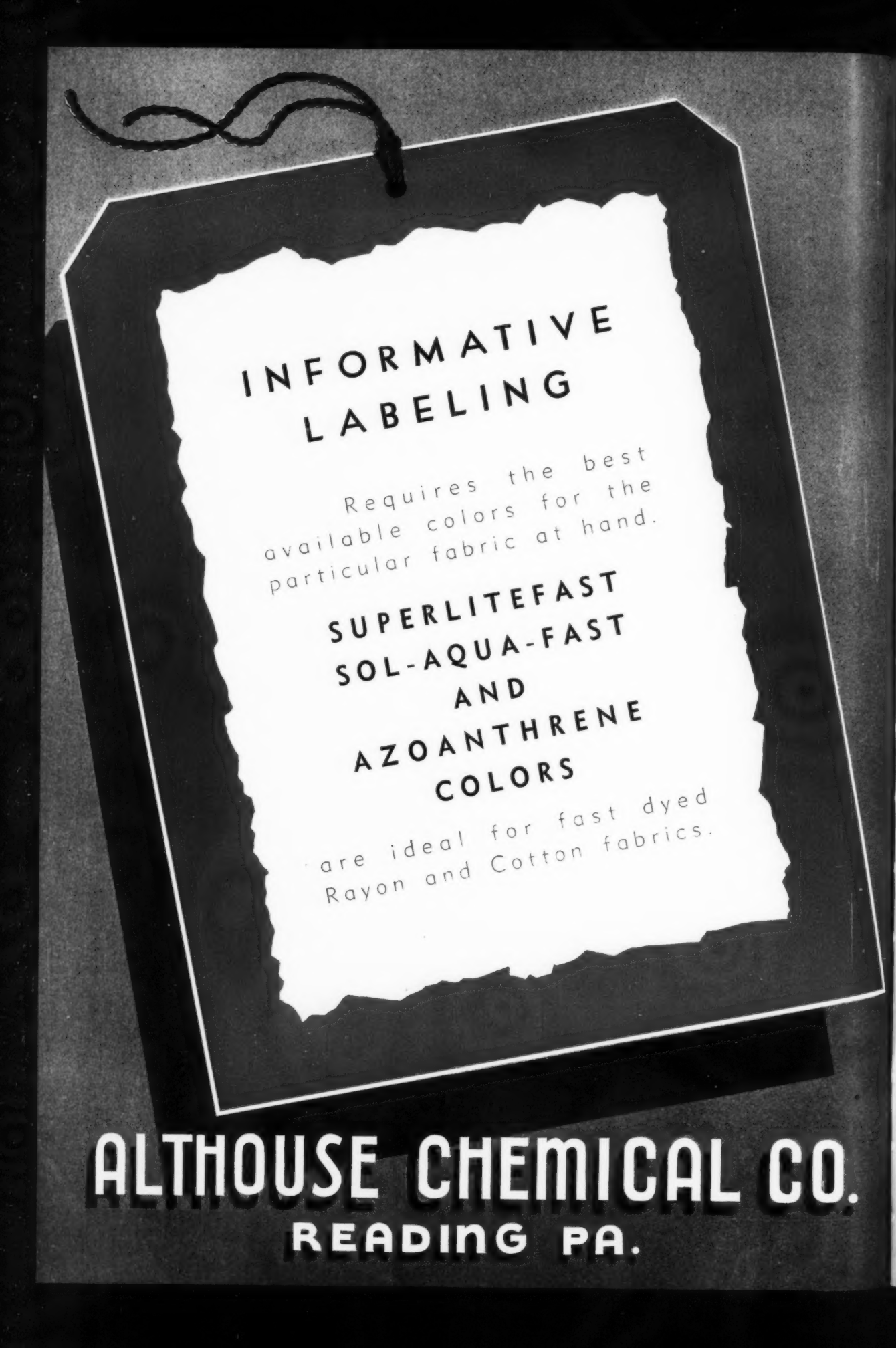
VITAL AS THE SKILLFUL BLENDING OF DYES is the blending of ability, experience and resources. Problems created by higher fastness standards, tighter specifications and new fibers or blends often can be solved by those dyers and dyestuff manufacturers who pool their skills. Such cooperation is the first step towards ensuring proper selection of dyes and processes.

Our Laboratories and Technical Staff have accumulated a fund of knowledge and experience that is always at your disposal. Use it whenever you face production difficulties. E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Dyestuffs Div., Wilmington 98, Del.

Du Pont Dyestuffs

DU PONT DYESTUFFS

ICIAL PUBLICATION
of the
PROCEEDINGS
RICAN ASSOCIATION
TEXTILE CHEMISTS
AND COLORISTS


INFORMATIVE LABELING
Requires the best available colors for the particular fabric at hand.
SUPERLITEFAST
SOL-AQUA-FAST
AND
AZOANTHRENE
COLORS
are ideal for fast dyed Rayon and Cotton fabrics.
ALTHOUSE CHEMICAL CO.
READING PA.

LEVELENE*

FREE FLOWING, NON-JELLING

More than a trade name.

A penetrant and levelling medium for direct, union, and CELANESE* dyes.

Effective either for stripping or for level dyeing when working with many of the vat type dyes.

A stable, dispersing penetrant for rotproof and mildewproof processing.

Economical and labor saving.

RATHER than ask for a laboratory sample—HAVE one of our technical men bring with him a sufficient quantity for a practical mill run. THEN judge for yourself as many mills have done and profited thereby.

*Reg. U. S. Pat. Off.

AMERICAN ANILINE PRODUCTS, INC.
50 UNION SQUARE — NEW YORK, N. Y.

— Dyestuffs —
Plant: Lock Haven, Pa.

BRANCHES

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Dominion Anilines & Chemicals, Ltd.
265 Adelaide Street West

Boston, Mass.
190 High Street

Chicago, Ill.
820 South Clinton Street

Charlotte, N. C.
301 East Seventh Street

Los Angeles, Cal.—1019 South Grand Avenue

*Reg. U. S. Pat. Off.

American Dyestuff Reporter, Vol. 33, No. 17. August 14, 1944. Published every other Monday. Copyright 1944, by Howes Publishing Co., 440 4th Ave., New York, 16, N. Y. Domestic subscriptions, $5.00; Canadian, $6.00; Foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y. Post Office, under the act of March 3, 1879.

CAMEL DYES
for SERVICE-ABLE FABRICS

The experience of the Campbell organization, representing over 68 years of uninterrupted dyestuff service to the textile industry, is your assurance of uniformity in the Campbell Line of quality dyestuffs.

Whether for service fabrics or consumer demand, Camel Dyes are available . . . plus the usual prompt

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JOHN CAMPBELL & COMPANY, INC.

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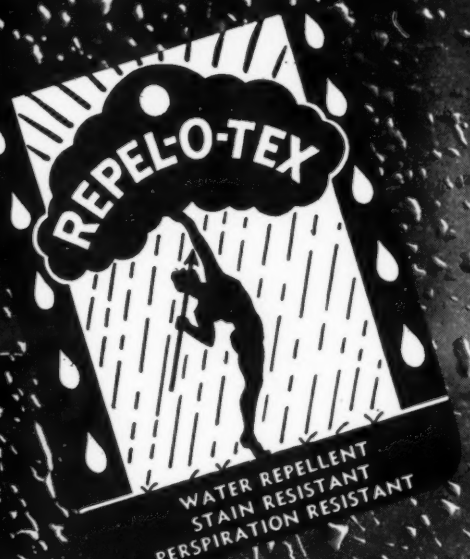
REPEL-O-TEX

THE SUPERIOR WATER REPELLENT



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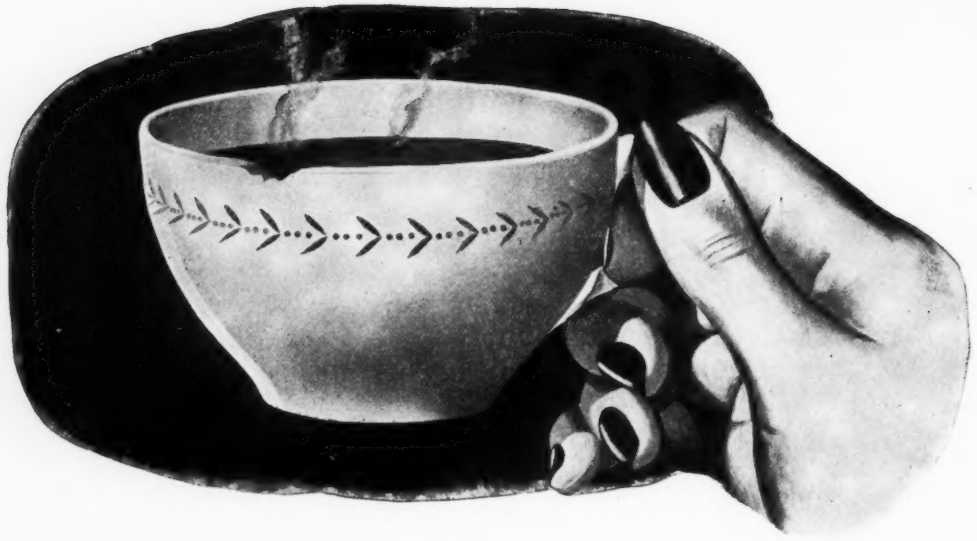
JERSEY CITY, N. J.

PROVIDENCE • CHARLOTTE • CHICAGO • LOS ANGELES • MONTREAL • TORONTO



The chipped teacup of the PATRIOTIC Mrs. Jones

No matter who the guest—Mrs. Jones brings out her chipped teacup with no embarrassment. On the contrary, with a thrill of pride.

Not very pretty, that chip. But it bears witness to the fact that Mrs. Jones has her nation's welfare at heart.

Mrs. Jones has given up all unnecessary spending for the duration. By doing *without*—she is helping to fight inflation.

Maybe she doesn't know all the complicated theories about inflation. But she does know that her government has asked her *not to spend.*

So Mrs. Jones is making all the old things do . . . not only that teacup. She's wearing her clothes for another year—and another. She's not competing with her neighbors for merchandise of any sort.

And the dollars she's not spending now are safely put away (and earning interest) for the peacetime years ahead. *Then* those dollars will buy things that can't be had for any price today.

If we all are like Mrs. Jones, there will be no inflation with skyrocket prices. If we all are like her, dangerous Black Markets cannot exist.

A chipped teacup stands for all that . . . for a *sound, secure* U. S. A.

7 RULES FOR PATRIOTIC AMERICANS TO REMEMBER EVERY DAY

1. Buy only what you *absolutely need.* Make the article you have last longer by proper care. Avoid waste.

2. Pay no more than ceiling prices. Buy rationed goods only by exchanging stamps. (Rationing and ceiling prices are for *your protection.*)

3. Pay willingly any taxes that your country needs. (They are the cheapest way of paying for the war.)

4. Pay off your old debts—avoid making new ones.

5. Don't ask more money for the goods you sell or for the work you do. Higher prices come out of everybody's pocket—including *yours.*

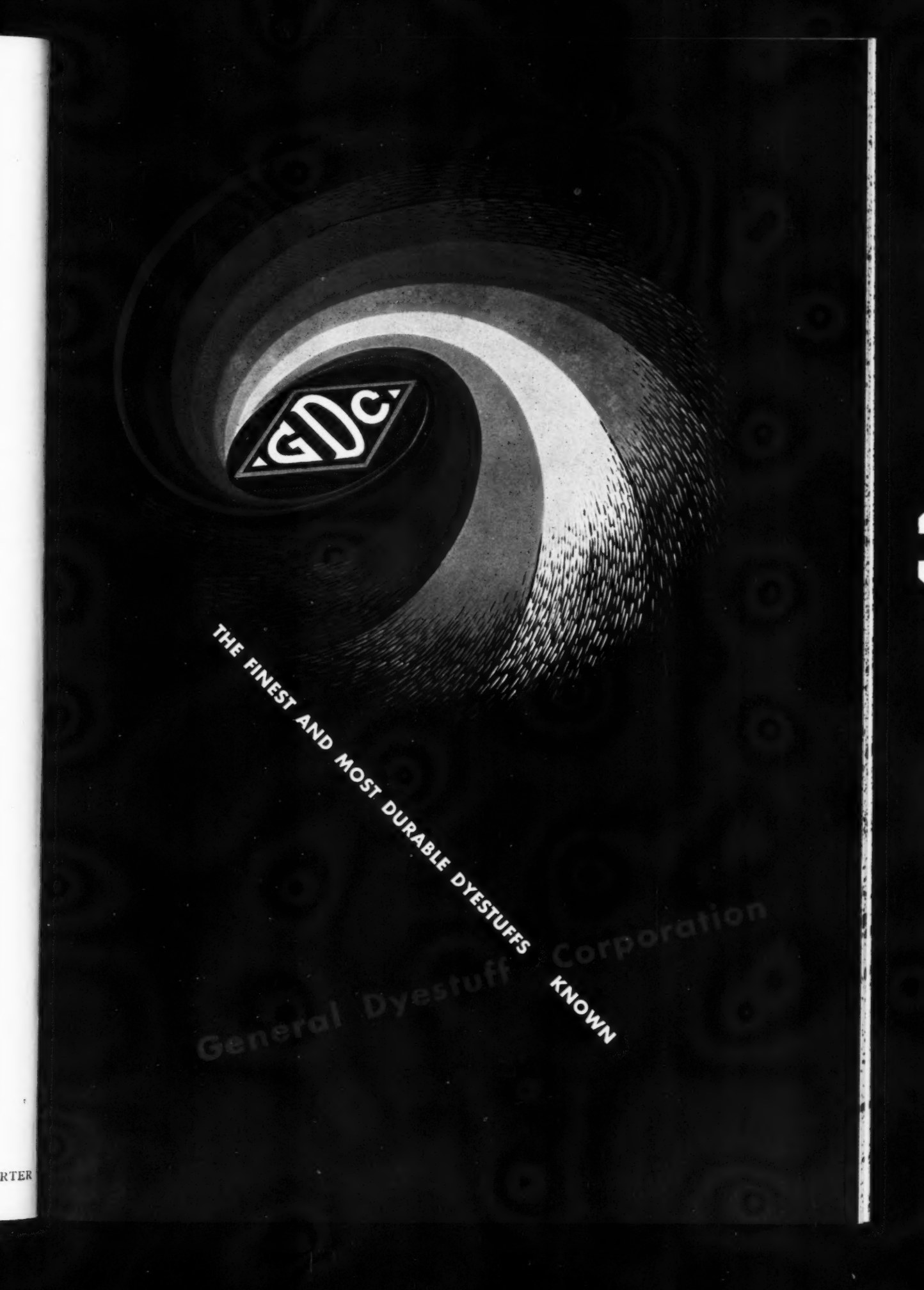
6. Establish and maintain a savings account; maintain adequate life insurance.

7. Buy all the War Bonds you can—and hold 'em!

HELP US KEEP PRICES DOWN

Use it up . . . Wear it out . . . Make it do . . . Or do without

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.


GDC
THE FINEST AND MOST DURABLE DYESTUFFS KNOWN
General Dyestuff Corporation

THIS IS NO TIME TO SHINE

No, maybe some of the stockings you've seen lately won't quite shine in a blackout, but they're certainly just like mirrors at any other time. The soft, sheer, eye-caressing, dullness that has long characterized quality hose is nowhere to be found in these products of a hectic period. • Amazing as it may sound, these stockings when treated with Fancourt's Dulzit become a definite asset to any woman's charm equipment. Just another example of Fancourt laboratory research in action. A talk with one of our field men will put our complete facilities at your disposal.

W. F. FANCOURT & CO.

PHILADELPHIA, PA.

Solving Finishing Problems Since 1904

In the South, Howard A. Virkler, Greensboro, N. C.

Quick as a Wink

NOPCO 2272-C WETS OUT FAST!

Recent tests, made under actual mill conditions, show that NOPCO 2272-C is one of the best performing wetting agents within its price range.

COMPARE NOPCO 2272-C with any wetting agent you now use — or have ever used — for:

1. SPEED in WETTING OUT and RE-WETTING at low concentrations and wide temperature range. Especially good for use in sanforizing.
2. CONSISTENT ABILITY in keeping Production UNIFORMLY FAST and Product Quality UNIFORMLY GOOD.
3. IT'S a really good wetting out penetrant for pad and pigment dyeing.
4. STABLE in caustic solutions of 3½ to 4%. WHAT'S MORE — It's inexpensive — 15½c per pound.
5. ALL OTHER ADVANTAGES expected of a high grade Wetting Agent.

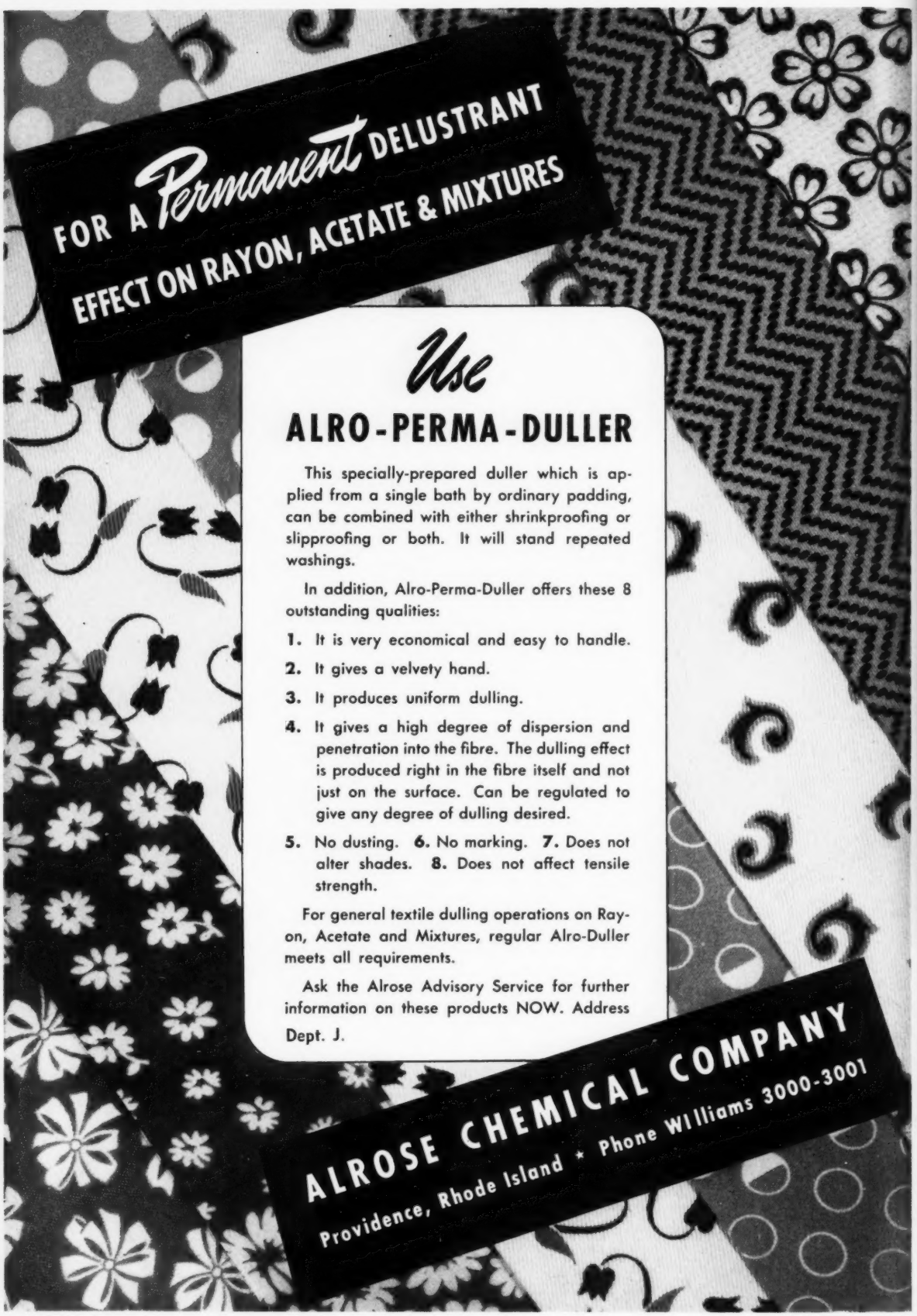
NOPCO 2272-C
A BETTER WETTING AGENT

Make this test at *our* expense. Send for free sample for actual plant test. Compare it with one you are using. We believe you'll agree that in NOPCO 2272-C we've developed the best wetting agent — dollar for dollar.

NOPCO — EVOLVED THRU RESEARCH

NATIONAL OIL PRODUCTS COMPANY

Boston • Cedartown, Ga. **HARRISON, N. J.** Chicago • Richmond, Cal.


FOR A Permanent DELUSTRANT
EFFECT ON RAYON, ACETATE & MIXTURES
Use
ALRO-PERMA-DULLER
This specially-prepared duller which is applied from a single bath by ordinary padding, can be combined with either shrinkproofing or slipproofing or both. It will stand repeated washings.
In addition, Alro-Perma-Duller offers these 8 outstanding qualities:
1. It is very economical and easy to handle.
2. It gives a velvety hand.
3. It produces uniform dulling.
4. It gives a high degree of dispersion and penetration into the fibre. The dulling effect is produced right in the fibre itself and not just on the surface. Can be regulated to give any degree of dulling desired.
5. No dusting. 6. No marking. 7. Does not alter shades. 8. Does not affect tensile strength.
For general textile dulling operations on Rayon, Acetate and Mixtures, regular Alro-Duller meets all requirements.
Ask the Alrose Advisory Service for further information on these products NOW. Address Dept. J.
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Providence, Rhode Island * Phone Williams 3000-3001

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For the Textile Industry

Cotton Rolls
Cotton and Wool Rolls
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Friction Calenders
Schreiner Calenders
Chasing Calenders
Rolling Calenders

Silk Calenders
Embossing Calenders
Cloth Pilers
Drying Machines
Dye Jigs
Mangles
Padders
Squeezers
Washers
Winders

Mullen Testers

It's costly to "RUB-OUT" processing mistakes!

WHY NOT AVOID THEM WITH OLATE?

When you're racing against time to meet unusually heavy production schedules, processing mistakes can be mighty costly. They waste time, manpower and materials.

Many a mill today is guarding against such mistakes by processing woolens, worsteds, rayons and synthetics with Olate. When you check the outstanding advantages of this pure, neutral textile soap, you will understand why Olate can do so much toward assuring trouble-free processing.

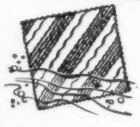
PROCTER & GAMBLE

EXCEPTIONALLY LOW TITER

Here is the reason for Olate's rapid solubility and its fast, thorough rinsing qualities. Olate's rapid solubility saves time, manpower and steam. Its free rinsing qualities—even at lower-than-average temperatures—offer you an important safety factor in your processing.

STABILITY AGAINST RANCIDITY

Olate is unusually resistant to oxidation and rancidity. This Olate advantage, coupled with its outstanding rinsing properties, gives you maximum protection against fabric discoloration and odor difficulties in the finished goods.



MILD BUT THOROUGH CLEANSING ACTION

There's probably no soap that treats all fibers and fabrics more gently than Olate. Thanks to the unusually careful selection and refinement of the oils used in making Olate, it is pure, neutral and safe. And Olate's thorough, efficient cleansing action matches its gentleness.

Olate — safe and efficient for every textile soap usage!

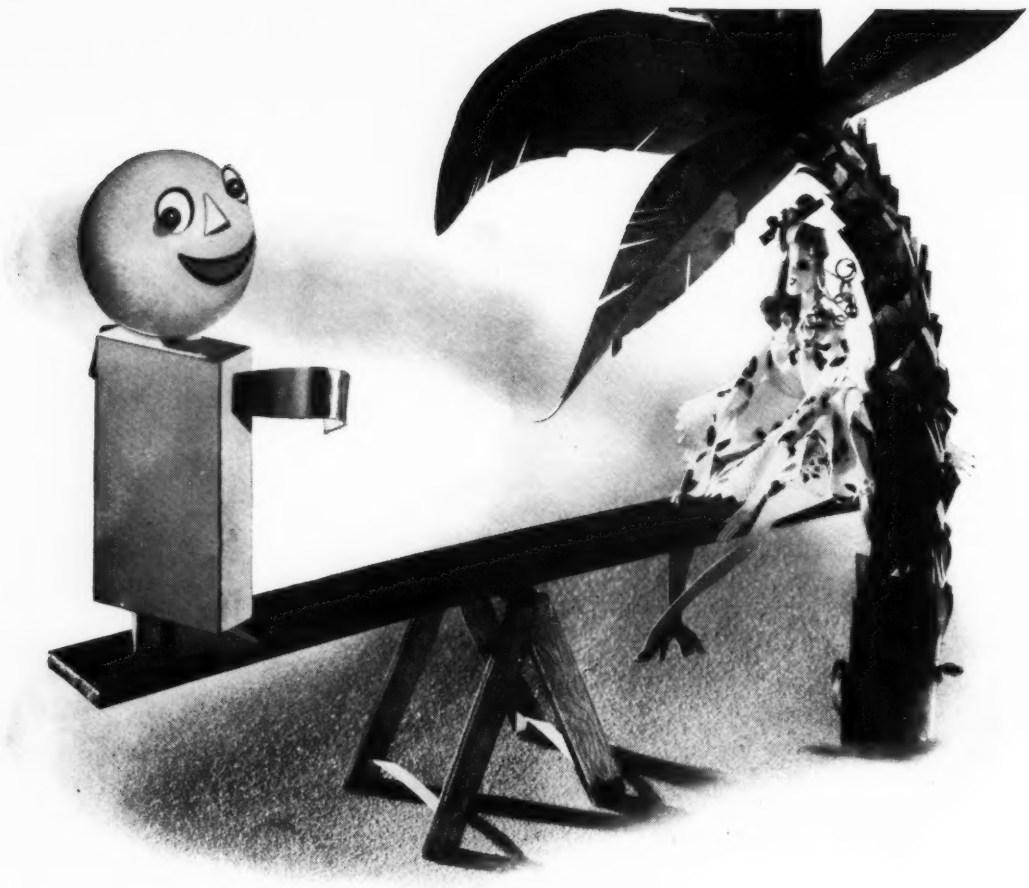
Eastone* Rubine C

*Eastone** *Rubine C* dyes a range of bordeaux shades—reddish in cast on cellulose acetate fabrics, somewhat bluer on nylon. It is popularly used as a self-color in full shades of wine produced by jig dyeing. For both jig and box work, Rubine C is useful in dyeing shades which require good penetration and build-up properties at low temperatures. General commercial fastness properties are good—particularly fastness to crocking, gas fading, and sublimation when steamed under pressure. Rubine C can be stripped from dyed pieces in an acidified zinc formaldehyde sulfoxalate bath.

Eastman Acetate Dyestuffs offer a wide variety of colors especially developed for the dyeing of cellulose acetate rayon fibers and the fabrics in which they are used. For information on Eastman Acetate Dyestuffs and their application, consult our New York Sales Representative, 10 East 40th Street, New York, N. Y., or write TENNESSEE EASTMAN CORPORATION (subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

EASTMAN ACETATE DYESTUFFS

** "Eastone" is a registered trade mark and denotes a type of dye which is dischargeable, as well as usable for plain dyeing.*



Prepare rayon piece goods for

MORE LEVEL DYEING

Rayon piece goods scoured with "Modinal"* D are left in an excellent condition for dyeing or bleaching. Streaks, specks and spots from hard water soap deposits are eliminated. Residual throwing oils and warp sizes are reduced. Undesirable odor is avoided. All this means fewer seconds, and therefore greater profits.

In the "Modinal" bath the rayon fibers swell slightly, making them full and pliable. Results—improved crepe effects and softer, more uniformly shrunk fabrics.

Take advantage of "Modinal" D to speed up and improve your wartime production. Gardinol Corp., General Offices, Wilmington, Delaware, Sales Agents: Procter & Gamble, Cincinnati, Ohio. E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

*"MODINAL" *is the trade mark used by the Gardinol Corporation to designate a group of its fatty alcohol sulfates.*

BACK OUR FIGHTING MEN WITH MORE WAR BONDS

MODINAL D *Fatty Alcohol Sulfates*

These Hooker Chemicals are Helping Textile and Dye Chemists

Listed below are some of the Hooker chemicals that are making life a little easier for textile and dye chemists. We have indicated their principal uses in your fields, but many of them have other uses in the textile field as well. All are being produced in commercial quantities and shortages are unlikely in adopting them for your processes.

Product Chemical Formula Molecular weight	*Description*	*Uses*
Aluminum Chloride, Anhydrous $AlCl_3$; 133.3	Gray crystalline solid	Catalyst; Dye making
Antimony Trichloride, Anhydrous $SbCl_3$; 228.1	Yellowish solid	Catalyst; Dye making; Mordant in textile printing; Moisture and fire-proofing textile
Benzoate of Soda C_6H_5COONa; 144.0	White crystalline solid	Dye intermediate
Benzoic Acid C_6H_5COOH; 122.1	White crystalline material	Dye intermediate
Dichlornaphthalene $C_{10}H_6Cl_2$; 197	White crystalline solid	Chemical intermediate
Cyclohexanol (Hexahydro Phenol) $C_6H_{11}OH$; 100.1	Clear, colorless liquid	Solvent
Monochlortoluene $C_6H_4Cl\text{-}CH_3$; 126.5	Clear, colorless liquid	Solvent; Dye intermediate
Orthodichlorbenzene $C_6H_4Cl_2$; 147	Clear, colorless liquid	Solvent; Dye intermediate
Phosgene (Carbonyl Chloride) $COCl_2$; 98.9	Colorless gas at ordinary temp Colorless to light yellow liquid under pressure	Dye intermediate; Chlorinating agent
Sodium Tetrasulfide Na_2S_4; 174.23	Aqueous solution containing 40% by weight of compound. Dark red liquid.	Manufacture of dyes

In addition to the chemicals listed above, Hooker makes many more that are being increasingly used in the textile and dyeing fields. Our technical staff has been helpful in solving problems in these fields with use of Hooker chemicals and is ready to work with you in the application of Hooker chemicals to meet your requirements. A copy of the Hooker General Products List, available on request, will give you an idea of the diversity of Hooker chemicals and their uses.

HOOKER ELECTROCHEMICAL COMPANY

2 Forty-Seventh Street • Niagara Falls, New York

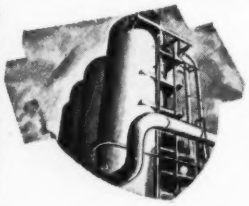
NEW YORK, N. Y. • TACOMA, WASH. • WILMINGTON, CALIF.

CAUSTIC SODA MURIATIC ACID BLEACHING POWDER
PARADICHLORBENZENE FERRIC CHLORIDE

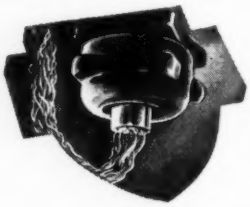
HOOKER CHEMICALS

GENERAL CHEMICAL

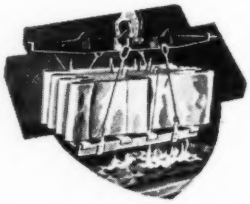
AGAIN GENERAL CHEMICAL CREATES NEW FACILITIES FOR SULFURIC ACID TO SERVE AMERICAN INDUSTRY



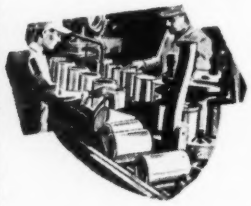
Petroleum
Alkylation, sulfonation, and improving color, odor, and stability of petroleum products.



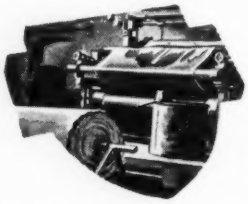
Rayon
Used in the spinning bath in rayon manufacture.



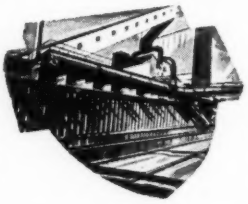
Steel
For pickling of steel sheets and castings; removes oxides and scales.



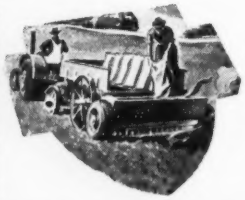
Paints
Raw material in production of pigments; for sulfonating drying oils.



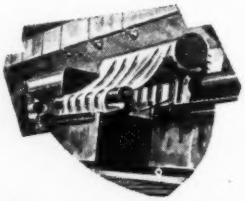
Sulfonation
Sulfonating vegetable oils for water, fire, and mildew-proofing fabrics and textiles.



Coke By-Products
For washing toluene and benzene, raw materials for dyestuffs and explosives.



Fertilizers
Used in super phosphate and ammonium sulfate production.



Textiles
For carbonizing wools and for the dyeing bath in production of textiles.

GRADES OR STRENGTHS
Standard: From 60° Baume to 65% Oleum (114.6% H_2SO_4)
Special High Purity:
Diamond—66° Baume, Carboys Only
Crystal —66° Baume, 98% H_2SO_4
From Carboys to Tank Cars & Barges

RECENTLY RELEASED: New technical information on physical and chemical properties of Fluosulfonic Acid. Write nearest Technical Service office for Bulletin 33A

GENERAL CHEMICAL COMPANY

GENERAL CHEMICAL COMPANY
40 RECTOR STREET NEW YORK 6, N. Y.

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AT LOW COST
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Vat dyes scarce? KAC No. 4 with B2 or Sussex Gum gives higher color yield . . . Produces soft finish.

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For sanforizing and weighting.

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For laundry resistant finishes.

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For starchless finishes.

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For sizing filament synthetic yarns . . . a protein size.

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For sizing staple synthetic yarns and blends.

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For pigment printing and pigment dyeing in water dispersions . . . Excellent wash fastness.

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78 YEARS OF SERVICE TO THE TEXTILE INDUSTRY

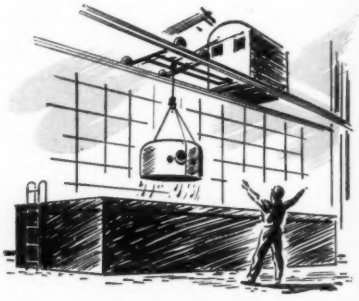
"...It took CHEMISTRY to realize the nation's wealth

American manufacturers once relied on *imported* camphor, an essential ingredient in many important products of industry. When war cut off these imports, however, the *domestic synthesis* of camphor was greatly enhanced by a substance which Hercules' chemists produced from wood turpentine . . . *Alpha-pinene.* This is just one example among hundreds of how Hercules research has helped bring to light the hidden wealth of our natural resources."

DAVID DIETZ, *Science Editor of Scripps-Howard Newspapers, Author, Pulitzer Prize Winner*

PROTECTING HEALTH from food contamination by flies and other insect germ-carriers is one of the jobs whose importance can hardly be exaggerated . . . a job now handled by a terpene chemical product. Thanite*, the modern toxic agent used in sprays, is in great demand.

WASHING WOOL—saving time. Yarmor* Pine Oil saves up to 30% of the time required for scouring and processing of wool. Yarmor is a wetting agent, lowering surface tension, emulsifying dirt and grease, producing fluffier, cleaner wool, helps get the most out of our wartime supply.



GREASE-GETTER. Another wetting agent is Dresinate*. Dresinate is speeding the production drive by making it easier for alkaline baths to replace solvent baths for *cleaning metals.* Effective in both strong and weak alkaline baths, it has no harmful chemical action on soft metals.

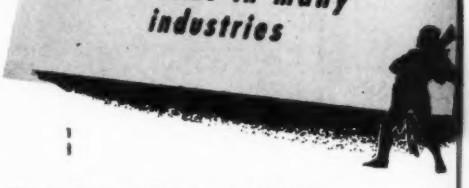
BEST SOLVENT. For many uses besides paints, there is conceded to be no better solvent than turpentine. Hercules produces the finest clear, pure, water-white turpentine which thins and spreads paint without weakening its color, helps dry it fast.

LESS RUTS. Just a small amount of Hercules' amazing new product, Stabinol*, when properly mixed with the top few inches of soil, and then compacted, makes a completely water-proof surface—*preventing mud.*

HERCULES

TERPENE AND ROSIN CHEMICALS

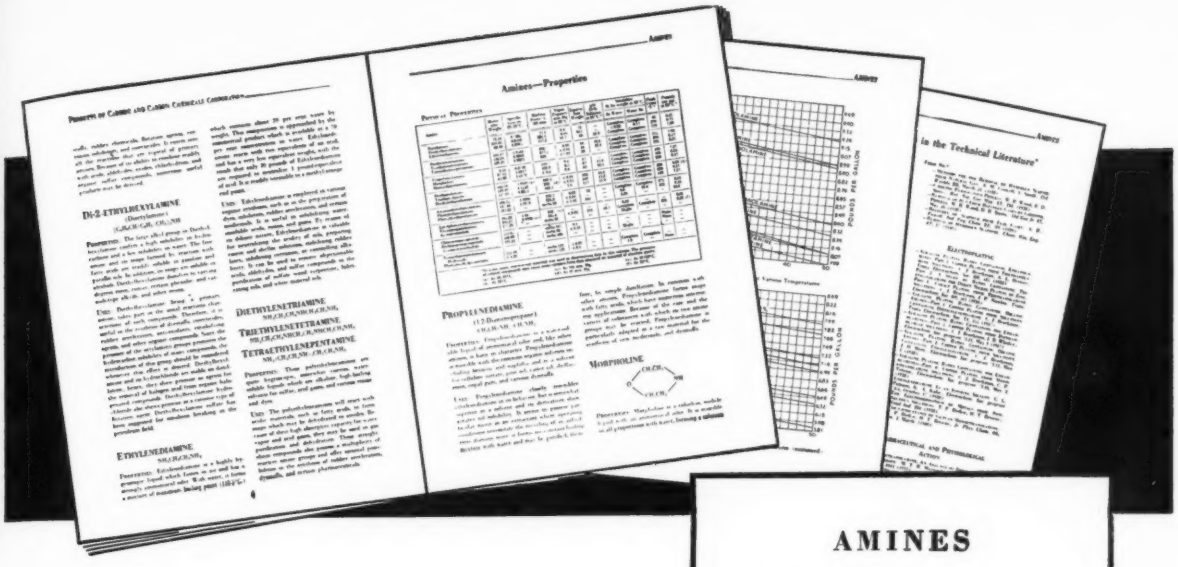
offer answers to material problems in many industries



HERCULES POWDER COMPANY
INCORPORATED

993 Market Street, Wilmington 99, Delaware

*Reg. U. S. Pat. Off. NI-42



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Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

Continuous Peroxide Bleaching (Part I—Its Development) 345

The Theory and Practice of Wool Dyeing (Leveling and Stripping of Dyed Material)..... 346
C. L. Bird

The Utilization of Wool by Four Saprophytic Microorganisms in the Presence of Additional Nutrients 353
Doris J. Hirschmann, Marion Zametkin and Ruth Elmquist Rogers

The Life of John Mercer..... 359

• Departments

Trade Notes—New Products..... 360

• Proceedings of the American Association of Textile Chemists and Colorists

Saturday Afternoon Session, Annual Meeting.. P349

One Hundred and Forty-Sixth Council Meeting... P350

One Hundred and Thirty-Ninth Meeting of the Research Committee P351

Committees for Annual Meeting..... P352

Tentative Program for Annual Meeting..... P352

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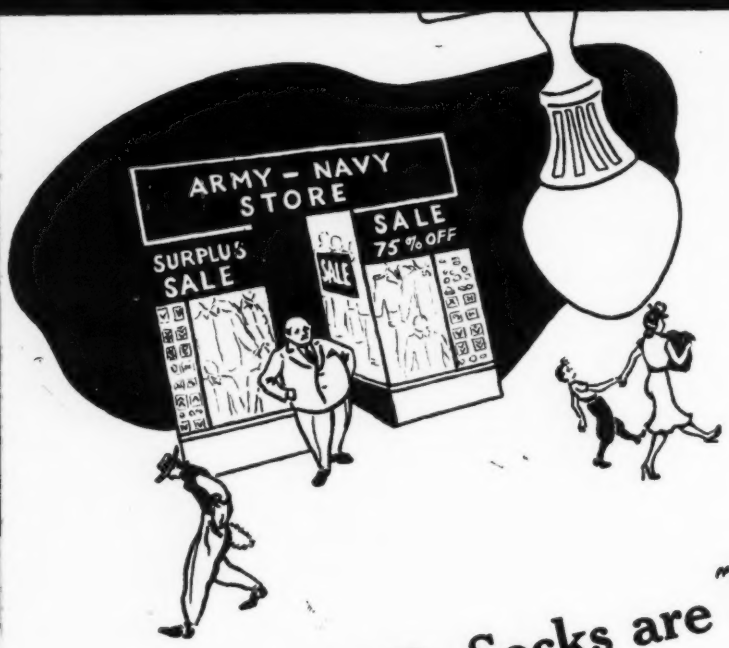

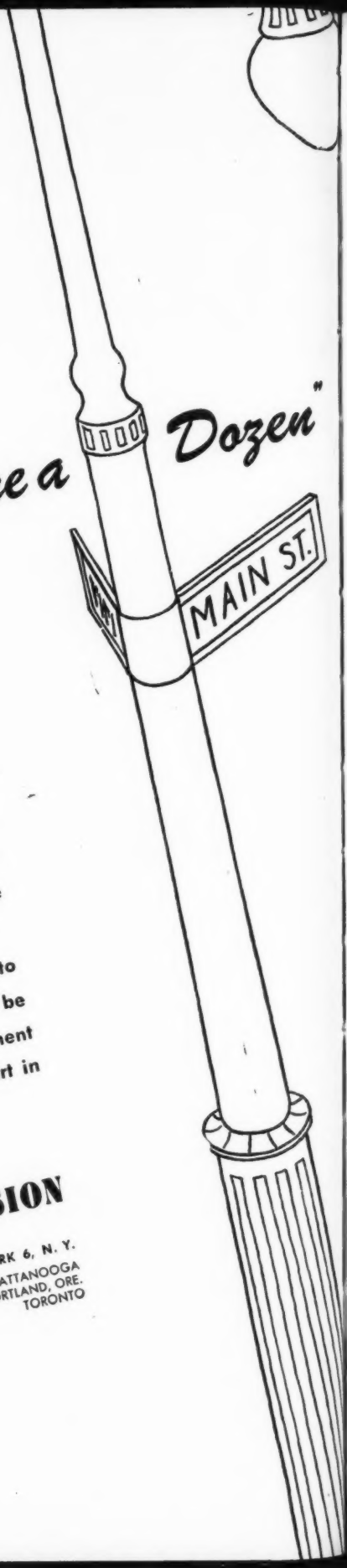

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VOLUME 33 AUGUST 14, 1944 NUMBER 17

CONTINUOUS PEROXIDE BLEACHING

BY THE TECHNICAL STAFF
of the
Buffalo Electro-Chemical Co., Inc.

I.—Its Development

This is the first in a series of four articles on the subject of continuous peroxide bleaching. The others in the series will follow in succeeding issues. The titles of the four parts are as follows:

I. Development
II. Operation
III. Equipment
IV. Adaptability

A GREAT many textile finishing plants in this country and abroad, were of the opinion that a good bleaching job consisted of producing cotton that was full white and practically 100 per cent cellulose. In other words, bleached cotton should not contain any impurities whatsoever — natural or artificial. To achieve this, it was necessary to subject the goods to a number of rather drastic treatments such as pressure boils in kiers with alkalies, treatments with strong oxidizing agents such as hypochlorite solutions, strong souring, etc. Such chemical procedures must be very carefully controlled to avoid damage to the cellulose. Every bleacher knows how easily cotton may be damaged by chemick or by acids.

Hypochlorites themselves bleach the coloring matter but do not remove particles of cotton seeds, motes, and other impurities. That job must be done by preliminary treatments such as desizing and kier boiling. It is the kier boiling that strips the cotton of all desirable and undesirable matter—leaving the cotton in a virtually denuded state—and it is up to the finisher to impart desirable properties after the bleach by artificial means.

Introduction of the peroxide bleach created many controversies — mainly because it was stated that this bleach does not take out all the natural impurities from the cotton. Furthermore, peroxide bleaching was considered too expensive for many types of goods. Yet—peroxide bleaching has been adapted to all types of goods—to goods to be dyed or printed, to full whites, to goods to be finished in a special way, to colored yarn goods, etc.

Peroxide bleaching may be carried out in many different ways—at any temperature desired, i. e., from room temperature to that above the boiling point of water. It can be modified in many ways. For example, it is possible to obtain fully absorbent white goods such as specification gauze—or to obtain bleached non-absorbent, yet mote-free goods.

It is this flexibility of the peroxide bleach that makes it so suitable for continuous bleaching.

Two important milestones mark the way to continuous peroxide bleaching.

The first was the discovery that goods saturated with a small amount of a fairly concentrated peroxide bleaching solution can be bleached at room temperature. The second was the discovery that the time of bleaching may be greatly reduced by subjecting the goods saturated in the above manner to the action of steam. These developments led first to the so-called "Cold Peroxide Bleaching Process"* which is widely used by many bleacheries. The application of steam then led to the development of the so-called "Peroxide Steam Bleach" which after further laboratory development as well as further practical development in commercial bleacheries, resolved itself in the process which is now known as "The Continuous Peroxide Bleaching Process."

In 1931, Becco carried out the first continuous bleaching experiments on cotton piece goods in a New York state bleachery. The equipment consisted of a closed container through which the goods passed; inside this container the goods—previously saturated with a peroxide bleaching solution—were subjected to the action of steam for various periods of time. The results were so encouraging that the process was patented.†

Several research groups then undertook the task of investigating from all angles the action of steam on peroxide saturated goods. Type of steam, time of treatment, chemical and chemical concentration, quality of the bleached goods and economical questions were studied. The most favorable results were then coordinated and considered in tackling the equipment question.

In 1938, a stainless steel scray with a preheating flue was built for continuous steam bleaching of heavy cotton goods in the open width, and a considerable yardage of goods was bleached successfully in this piece of equipment. A second and larger stainless steel Jay box was then erected for full-scale production in a Pennsylvania finishing plant.

The goods were first saturated in the open width with a suitable solution, squeezed to a predetermined liquor ratio, passed through a heating chamber in which steam was applied and then plaited into the J-box, through which they passed in about 40 minutes. The goods were then washed through a vertical multi-roll washer, which was specially designed in cooperation with a textile equipment manufacturer. This fully open width continuous bleaching unit has been in operation since that time and has produced many million yards of steam bleached goods, both for white and for dyeing.

Continuous heating of goods in rope form presented new problems since all parts of the goods have to be heated evenly while the goods travel at high speeds. Equipment for treatment of goods in rope form can be operated at speeds of 250 yards per minute and higher. In order to operate at such high speeds for continuous

* U. S. Patent No. 2,107,297.

† U. S. Patent No. 2,029,985.

steam bleaching, it seemed necessary to build special preheating chambers and devices. Such equipment was designed and has been installed in conjunction with stainless steel J-boxes in a number of bleacheries. Experiments have also been made with endless belts onto which the cloth is dropped and which pass through enclosed chambers filled with steam. Such equipment necessitates enclosing of driving mechanisms such as driven rolls and pilers, which are continuously exposed to steam.

Becco devised an extremely simple way of steam heating the goods without auxiliary equipment and avoiding any losses of steam while still permitting high speed operation.

It has been found that goods can be heated evenly and uniformly by applying direct steam to the bulk of goods in a J-box. The unheated goods are used as an effective seal to prevent steam from escaping in the atmosphere while they move continuously to the heating zone. In this manner, goods may be heated in the most economical and simple way and all piling and driving equipment is in the open, out of contact with steam and in full view of the operator at all times. Such J-boxes have been installed in a number of bleacheries for continuous bleaching of goods in the rope form, for bleaching of all types of goods, lightweight and heavy fabric, for plain white and colored yarn goods.

A Continuous Peroxide Bleaching Range of this type has produced 4470 lbs. of fully bleached goods per hour. When this figure is compared with the kier boiling method—boiling of 6000 lbs. for 12 hours —for instance, it becomes apparent what great strides have been made in the textile bleaching industry.

It is not alone this greatly increased production that makes the continuous peroxide bleaching process so attractive but also the greatly reduced chemical cost while maintaining the highest standard of quality of the bleached goods. In fact, this reduction of cost is of such a magnitude that the continuous peroxide bleaching process is now in line with the cost of chemick bleaching.

A number of bleacheries have already begun to switch to continuous bleaching, but the war has retarded further developments temporarily. As soon as restrictions on materials and manpower are eased, many companies who want to modernize their bleachery will adopt this new development which already has shown so many benefits to the industry.

(Part II will appear in the next issue)

—♦ ♦—

The Theory and Practice of WOOL DYEING*

Levelling and Stripping of Dyed Material

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A successful dyer, besides knowing how to apply dyes, must know how to remove or "strip" them from dyed material, an operation which must be carried out carefully in order to avoid damaging the material. The choice of method is governed by the nature of the material, the dyes present, the existing shade and the desired shade.

DYEING does not always succeed at the first attempt and every dyer has a certain proportion of "cobblers," i.e., dyeings which cannot be passed. The commonest defects in material which has been dyed are (1) a shade which does not match the pattern, and (2) unlevelness. If the shade is lighter than the pattern a matching can usually be obtained by further dyeing with a shading color of the appropriate hue, which is a relatively simple operation. On the other hand, if the dyeing is darker than the pattern a matching cannot be obtained until some of the dye already present on the material has been removed, i.e., the dyed material must be "stripped." There are many causes of unlevelness in dyed material and unlevelness exists in a variety of forms, but it is not proposed to discuss these problems in this article, except in so far as they render stripping necessary. Frequently, the only way to correct an unlevel dyeing is to remove the whole of the dye already applied and then re-dye, if necessary after applying some treatment to the stripped material in order to remove the cause of the unlevelness. A further reason for stripping dyed material is when it is no longer saleable in its existing shade.

Stripping of dyed wool rendered necessary by an unsatisfactory dyeing is mainly of importance for yarns and, in particular, pieces. With loose wool and slubbing any moderate degree of unlevelness will be eliminated in the subsequent blending operations, and the need for correcting the shade can be obviated by blending with material of a complementary hue.

It may be stated at the outset that stripping processes should be avoided wherever possible, because all stripping processes damage the wool to some extent,[1] particularly the finer wools. The possibility of producing an acceptable result by dyeing the material a darker shade, e.g., navy blue, nigger brown or black, should, therefore, always be borne in mind. As a last resort the material can always be dyed black, a shade which covers a multitude of dyeing sins. Dyeing to a darker shade, particularly black, usually means that the dyer will lose financially over the transaction. Consequently, he will prefer to resort to the technically less sound process of stripping if there is a reasonable chance of "getting away with it," i.e., of producing a level match to the pattern without obvious deterioration of the material.

RAGS[2]

The stripping of dyed wool is necessary for another purpose besides the correction of faulty dyeings, viz., the removal of color from rags. Whilst stripping is avoided in the rag trade to a large extent by careful sorting of the rags into different colors and light and dark shades of the same color, it is frequently necessary to strip the rags where light shades are required in the subsequent shoddy material, or when the dyes present are insufficiently fast to milling. Since the stripping methods available differ in severity, care is required in selecting the method most suitable for the material to be treated; often, the stripping employed for rags is unduly severe.

GARMENTS[1, 3]

A somewhat similar position is encountered in the garment dyeing trade, where stripping is largely employed, not only in order to obtain a sufficiently light ground for re-dyeing, but also on account of variations in shade due to fading. Stripping provides the garment dyer with a level ground on which to build up the desired shade. For garments, the stripping process should be as mild as possible be-

* Reprinted from the "Textile Recorder," May, 1944.

cause, in most cases, the material has already lost some of its strength due to wear, repeated washing, or exposure to light and air.

Levelling processes depend on the ability of the levelling agent to weaken the combination between the dye and the wool, thus facilitating even distribution of dye throughout the material. Stripping processes involve the actual destruction of the dye present on the wool and the chemical reaction employed is either *(a)* oxidation or *(b)* reduction, the products of which are usually only lightly colored, at most. Some dyes are resistant to oxidation and reduce to leuco-compounds which soon re-oxidize back to the original dyes when the material is washed off or exposed to air. In such cases stripping is almost impossible, but fortunately, the majority of wool dyes are azo compounds, and compounds of this type can be readily and permanently reduced. The following levelling and stripping processes may be employed; usually, one of these processes is sufficient to obtain the desired result, but in difficult cases it may be necessary to apply two consecutive processes of different types.

(1) LEVELLING WITH GLAUBER'S SALT

Apart from the use of hot water alone, which often removes an appreciable amount of dye, this is the mildest type of stripping process, but it is only suitable for wool dyed with equalizing acid dyes where it is required *(a)* to level up the dyeing, and/or *(b)* to remove some of the dye because the shade is darker than the pattern. The material, e.g., a wool piece, is treated at the boil for 30 min. in a clean liquor containing 5-40 per cent Glauber's salt on the weight of the material. If it is desired to remove as much of the dye as possible, some undyed wool material may be run alongside the dyed material to absorb some of the dye removed from the latter. If the degree of unlevelness or darkness is slight, the addition of "grey" material is unnecessary and the faulty-dyed material may be brought to the desired shade in the same bath by careful addition of sulfuric acid and shading colors of the "salting" type after part of the dye has been removed with the aid of Glauber's salt. The function of the Glauber's salt may be illustrated in a simplified manner in the form of a reversible equilibrium:

$$\left|\begin{matrix}-NH_2 + D- \\ -NH_2 + D-\end{matrix}\right. + Na_2SO_4 \rightleftarrows \left|\begin{matrix}-NH_2 + \\ -NH_2 +\end{matrix}\right. SO_4 = + 2\,NaD \quad (1)$$

where $|-NH_2 + D-$ represents one-half of one of the wool's ionized salt linkages combined with one dye anion.

(2) LEVELLING WITH AMMONIA

If the acid dyes present do not level readily, or if it is desired to remove a considerable portion of the dye, treatment with Glauber's salt may not be adequate. Weak alkalis such as ammonia are much more effective than Glauber's salt, and a suitable treatment consists of 30 min. at 70° C. in a liquor containing ½-pint 0.880 ammonia per 100 gallons. A small quantity of a dispersing agent may be added with advantage. As with Treatment (1), the material can often be brought to the desired shade after stripping with ammonia by careful addition of acid, when the dye should return to the material in a level manner.

Hot alkaline solutions impair the handle of wool materials; and a somewhat milder treatment — which is, however, more effective than the use of Glauber's salt—consists of treating the wool for 30 min. just under the boil in a liquor containing, per 100 gallons, 2-5 lb. pyridine. Pyridine, besides being a very weak base, has strong solvent properties for dyes. The pyridine treatment is particularly suitable for stripping part of the color from carpets which are to be re-dyed.

(3) STRIPPING WITH SODA ASH

An even more effective alkaline strip, which is suitable for rags but not for yarn or pieces on account of its effect on the wool, consists of a treatment for 30 min. at 40° C. with 4-8 per cent soda ash on the weight of the material, followed by thorough washing off and, if necessary, a sour. This treatment will largely remove any equalizing acid dyes present and it is often used as a preliminary to treatment with a reducing agent. The action of the alkali may be represented as taking place between the wool-dye combination and the small amount of caustic soda produced by hydrolysis of the soda ash:—

$$|-NH_2D + NaOH \rightarrow |-NH_2OH + NaD \quad (2)$$

If $Na+$ is replaced by NH_4+, the same equation can be used to represent the action of the ammonia strip.

(4) STRIPPING WITH SULFURIC ACID

The dyed material is boiled with 6-12 per cent sulfuric acid on the weight of the material for 30-45 min. This method, which is no longer of great importance, was formerly of value for stripping natural dyewoods, e.g., logwood, from rags and for removing basic dyes. Equalizing acid dyes and Neolan dyes,[4] also, are stripped to some extent by this treatment, owing to the excess of sulfate ions competing with the dye anions for the amino groups of the wool in a similar manner to that shown for Glauber's salt in Equation [1]. After this acid treatment washing off is frequently omitted, soda ash being added to the dye liquor to neutralize excess acid in the material before re-dyeing is commenced.

According to Farrell and Walker,[3] mordant dyes can be largely removed from wool by first of all splitting up the dye lake by means of a treatment with a 0.5-1.0 per cent solution of a mixture of hydrochloric and oxalic acids for 20 min. just under the boil, and then treating with a hot dilute ammonia solution.

(5) STRIPPING WITH BICHROME AND SULFURIC ACID

A solution of bichrome (sodium dichromate or potassium dichromate) and sulfuric acid has powerful oxidizing and stripping properties. The chemical reaction may be represented as:—

$$Na_2Cr_2O_7 + 4H_2SO_4 = Na_2SO_4 + Cr_2(SO_4)_3 + 4\,H_2O + 3\,O \quad (3)$$

This form of stripping treatment has been largely used for colored rags, and may consist of a boil for 30-45 min. in a solution containing 3-6 per cent bichrome and 6-12 per cent sulfuric acid (D.O.V.) on the weight of the material. The percentage of acid used for stripping rags is often very large, e.g., 20 per cent D.O.V. on the weight of the material, to which is added 3 per cent bichrome and, if desired, 1-2 per cent oxalic acid. Under such drastic conditions the time of treatment should not exceed 15 min.; even then the material is impoverished and the penetration poor. Bichrome and sulfuric acid provide a very effective strip, but the brownish-yellow ground obtained is unsuitable for many light shades, e.g., light blues. The process also mordants the wool as well as stripping the color, and suitable chrome dyes may be applied without the use of further bichrome. It is also possible, by choosing acid dyes which are resistant to bichrome, e.g., Wool Fast Blue BL (*Colour Index*, No. 833), to strip and dye rags in the same bath.

(6) STRIPPING WITH SULFOXYLATEFORMALDEHYDE AND WITH SODIUM HYDROSULFITE[5]

The discovery of the sulfoxylate-formaldehydes at the beginning of the present century was of the greatest importance, both to the wool dyer and to the calico printer, and the use of these compounds for stripping purposes has now largely superseded the use of the less effective bichrome and sulfuric acid combination.

The most important of the sulfoxylate-formaldehydes is the sodium salt, which has the formula:—

$$NaHSO_2.CH_2O.2H_2O$$

It is sold in the form of hard white lumps, or powder, is soluble in water, and has powerful reducing properties from an acid bath. The reaction which brings about the reduction of dyes may be represented as:—

$$NaHSO_2.CH_2O + H_2O = NaHSO_3.CH_2O + H_2 \quad (4)$$

The zinc salt is marketed in the form of a soluble white powder, and has the formula

$$Zn< \begin{matrix} HSO_2.CH_2O \\ HSO_2.CH_2O \end{matrix}$$

This compound is somewhat more expensive than the sodium salt, but in certain cases, e.g., worsted pieces, it often gives a better strip. The insoluble (soluble in acids) basic zinc salt is also available, as a grey powder, and has the formula

$$Zn< \begin{matrix} OH \\ HSO_2.CH_2O \end{matrix}$$

It is somewhat cheaper than the other two compounds and is used for stripping rags, but it has the disadvantage that the stripped material contains zinc.

All three compounds are applied in a similar manner and, in general, give similar results, but the differences may be appreciable, not only among the three products but also with the same product using different acids. Differences in skill and differences in local conditions also count, so that one dyer may prefer one product whilst another dyer, although doing the same kind of work, may obtain better results with one of the other products.

The method of application of these compounds can be illustrated by taking Formosul (a sodium salt) as representative of the class. Formosul does not exert its stripping action at low temperatures and is quite stable under these conditions. Stripping commences when the temperature is just below the boil and then takes place gradually. An acid bath is necessary and the rate of stripping is greatly influenced by *p*H. The absence of acid may cause tendering and harshness in the material, whilst too low *p*H values will produce too rapid decomposition of the Formosul. The best acids to use are formic and acetic acids which, being weak acids, are less likely to be present in excess; sulfuric acid is also suitable, but any excess of this acid will cause too rapid decomposition and insufficient penetration of the Formosul, and the strip obtained is usually somewhat inferior to that obtainable with either formic or acetic acid, which should always be used for stripping union materials. A suitable recipe is as follows: the material to be stripped—which should not contain oil or dirt, and, if carbonized, may need neutralizing,—is entered into a bath containing, on the weight of the material, 2-4 per cent Formusol and 1.5-2.5 per cent formic acid (85 per cent) or 3-5 per cent acetic acid (30 per cent). The temperature is then raised to the boil in 30 min. and kept at this temperature for 20-30 min. It is essential that the bath should remain acid to litmus paper throughout the process, otherwise undecomposed Formosul may be left in the goods and cause trouble in subsequent dyeing. The material is finally rinsed well, first in warm water and then in cold water.

The majority of dyed wool materials are satisfactorily stripped by this process, although, owing to the color of the decomposition products, a white strip is seldom obtained, the color usually ranging from a light fawn or grey to a brown in the case of Coomassie Navy Blue. The color of the stripped material will depend both on the type of dye present before stripping and upon the depth of the original shade, but, owing to the preponderance of azo dyes, the color of the stripped ground is usually sufficiently light to enable the desired shade to be obtained in the subsequent dyeing process. However, there are exceptions. Indigo and dyes of the azine class, e.g., Wool Fast Blue BL, do not strip satisfactorily with reducing agents, because the leuco-compounds produced re-oxidize to the original dyes during washing off. With Indigo-dyed material the best result is obtained by stripping first with bichrome and sulfuric acid and then, after thorough rinsing, with Formosul and formic acid, although the result obtained does not always justify the extra cost entailed by the double process. Subsequent re-oxidation with dyes of the triarylmethane and anthraquinonoid classes, e.g., Patent Blues and dyes of the Acid Alizarine type, can be largely or entirely prevented by adding a little formaldehyde to the exhausted Formosul stripping bath.

Some dyers maintain a standing bath of Formosul, but it is doubtful whether the resulting small saving in chemical costs outweighs the attendant disadvantages. Not only is the stripping process less easy to control from a standing bath, owing to the unknown amounts of residual Formosul and acid present, but the accumulation of reduction products soon converts the standing bath into a weak dyevat and the stripped grounds become gradually less and less satisfactory.

The degree of control and penetration of the material which are possible when using Formosul are illustrated by the fact that it is possible to strip dyed wool cheeses with Formosul and obtain an even strip. Stripping the wool in chese form preserves it in better condition than stripping in hank form. A stainless steel machine should be used for stripping cheeses; for wool in other forms, e.g., rags, a wooden vat should be used, because the presence of iron is liable to cause staining of the material, whilst copper may cause tendering.

Sodium hydrosulfite is a soluble white powder which should be stored in a tightly closed tin. Its stripping, i.e., reducing, action is represented by the equation

$$Na_2S_2O_4 + 2H_2O = 2NaHSO_3 + H_2 \quad (5)$$

Although the reducing power of sodium hydrosulfite is equal to that of the sulfoxylate-formaldehyde compounds, it is used to a much smaller extent than the latter compounds for stripping dyed wool, because of the rapidity with which its solutions decompose at low temperatures[4] and the difficulty of controlling the stripping process, in consequence of which the stripping is liable to be unlevel. However, sodium hydrosulfite is valuable to the wool dyer, not only for Indigo dyeing, but for the following purposes as well: (1) for clearing (a) effect threads of cotton or viscose rayon in worsted pieces which have become stained during piece dyeing; or (b) light colored wool yarns which have become stained by adjacent dark colored yarns during the milling of the piece; in both cases the material is worked for 10-15 min. in a cold weak (e.g., 0.25-0.50 per cent on the weight of the material) bath of sodium hydrosulfite made alkaline with soda ash, and finally washed well in cold water. (2) For bleaching blankets and wool yarns after peroxide bleaching.

Other stripping agents which are of less importance but may be found useful on occasion are the oxidizing agents, potassium permanganate and hydrogen peroxide, and the reducing agent, titanous sulfate.[5, 7]

It will usually be found that, owing to slight damage to the scale structure of the fibers, wool materials which have been stripped will take up milling acid and chrome dyes more rapidly than wool which is being dyed for the first time.

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[3] Farrell & Walker, "Dyeing & Cleaning," C. Griffin, 1929, pp. 164-176.
[4] Forster, "J.S.D.C.," 1934, *50*, 282.
[5] Starkie, "Dyer," 1936, *76*, 419.
[6] Appleton, ibid., 1944, *91*, 137, 179.
[7] Anon., "Textile Recorder," 1939, November, pp. 29 and 31.

The Annual
PROCESSING
REVIEW
NUMBER
will appear
DECEMBER 4, 1944

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This issue will contain complete reports of the Annual Meeting to be held in Atlantic City in October.

PROCEEDINGS OF THE

American Association of Textile Chemists and Colorists

AUGUST 14, 1944

Officers of the Association

WILLIAM D. APPEL, *President*
National Bureau of Standards, Washington, D. C.

HUGH CHRISTISON—CHARLES A. SEIBERT, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline Division, Allied Chemical & Dye Corp., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

COUNCILORS

Representing Sections

ALLISON R. FLETCHER; BEN VERITY (Rhode Island)
JAMES P. CONAWAY; ARTHUR E. JONES; JOHN F. McCOY (Philadelphia)
KENNETH H. BARNARD; J. ROBERT BONNAR; J. ERNEST MEILI; GEORGE A. MORAN (New York)
JOHN N. DALTON; HARRY M. HARTNETT; CHARLES H. A. SCHMITT (N. New England)
C. NORRIS RABOLD; R. E. RUPP (Piedmont)
ROBERT W. PHILIP (South Eastern)
JACK ANDERSON (South Central)
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ELVIN H. KILLHEFFER; P. J. WOOD; ROBERT E. ROSE; WILLIAM H. CADY; ALBAN EAVENSON; CARL Z. DRAVES; THOMAS R. SMITH

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Azel W. Mack, Secretary, Hart Products Corp., 176 Federal St., Boston, Mass.
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Norman A. Johnson, Secretary, American Dyestuff Reporter, 440 4th Ave., New York, N. Y.
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Philadelphia Section

Boyce C. Bond, Chairman, 10 Meredith Road, Overbrook, Philadelphia, Pa.
A. E. Raimo, Secretary, John Campbell & Co., S. E. Corner Broad and Spring Garden Sts., Philadelphia 23, Pa.
Arthur W. Etchells, Vice-Chairman; Curt R. Baeringer, Treasurer

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R. W. Freeze, Secretary, American Aniline Products, Inc., 2202 Chamberlain Ave., Chattanooga, Tenn.
J. A. Crumley, Vice-Chairman; W. K. Newman, Treasurer

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Virgil T. Hartquist, Chairman, Wayne Knitting Mills, Fort Wayne, Ind.
Louis Hoehn, Jr., Secretary, Nyanza Color & Chemical Co., 549 West Randolph St., Chicago, Ill.
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J. E. Smenner, Vice-Chairman; Laurie E. Whittelsey, Treasurer

STUDENT CHAPTERS

Lowell Textile Institute
North Carolina State College
Philadelphia Textile Institute
New Bedford Textile School

Members should notify the Secretary immediately of all address changes.

SATURDAY AFTERNOON SESSION, ANNUAL MEETING

IN ORDER to report even a fraction of the vast amount of research and investigational work done in the last three years, many of the technical papers to be presented on Saturday morning have been prepared as resumes. Realizing that there has been much important work done which has not been included in the program, the Technical Program Committee has arranged for a Saturday afternoon session, at which individual or corporate members may present 25 to 30 minute papers or movies to report such work. This session is being arranged in response to several requests by manufacturers for an opportunity to report their work. There will be time for five or six such presentations on Saturday afternoon beginning at 2:00 o'clock.

Members who desire to present papers at that time should communicate with the Technical Program Committee immediately. It will be necessary to submit a 65-75 word abstract together with the title of the paper and the name of the author not later than September 1. This will allow adequate time for printing. In case more papers are submitted than the time permits, the Technical Program Committee reserves the right to select those to be presented. If too few papers are submitted, this Saturday afternoon session will be cancelled.

GLEN S. HIERS
Chairman, Technical Program Committee
Collins & Aikman Corp.
5000 Parkside Ave.
Philadelphia 31, Pa.

ONE HUNDRED AND FORTY-SIXTH COUNCIL MEETING

THE Council held its 146th meeting at the Downtown Athletic Club in New York on Monday morning, June 19, 1944. Present were President William D. Appel, presiding; Hugh Christison and Charles A. Seibert, Vice Presidents: William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; Carl Z. Draves and P. J. Wood, Past Presidents; Harry M. Hartnett and Charles H. A. Schmitt representing Northern New England; Ben Verity representing Rhode Island; Kenneth H. Barnard, J. Ernest Meili and George A. Moran representing New York; James P. Conway and John F. McCoy representing Philadelphia; C. Norris Rabold and Raphael E. Rupp representing Piedmont; Robert W. Philip representing Southeast; Leonard S. Little, Chairman of the Executive Committee on Research; Bertil A. Ryberg, Associate Research Director; Miles A. Dahlen; and Harold C. Chapin, Secretary.

The Secretary's report of the 145th Council meeting and financial report of June 12, and the Treasurer's report of June 15, were accepted. Approval by letter ballot was reported for new wording of Article IV of the By-laws as follows:

Committees. Section 1. Except where otherwise specified, the following Standing Committees of the Council with chairmen shall be appointed annually, an Executive Committee on Research, a Publicity Committee, a Committee on Appropriations, a Committee on Membership and Local Sections, a Publications Committee, and a Committee on Corporate Memberships.

Section 2. The Executive Committee on Research shall be composed of the President of the Association, the retiring President, the Chairman of the Research Committee (appointed by the Council as provided in the Constitution), and three Senior members appointed by the Council. The three members first appointed shall serve for 3, 4 and 5 years respectively, and each one shall be replaced at the end of his term by a new member appointed for three years. No one may serve as Chairman of this Committee more than 3 consecutive years. This Committee shall be responsible for the general research policy and program of the Association and for the organization and operation of the employed staff.

Section 3. The Publicity Committee shall be appointed by the Council. It shall be the duty of this Committee to devise ways and means whereby the necessary publicity may be given to all activities and publications of the Association and its Local Sections.

Section 4. The Committee on Appropriations shall consist of the Treasurer and Secretary of the Association and three Past Presidents appointed by the Council. Any proposal made to the Council at any meeting involving the expenditure or investment of the Association's funds, before being voted on by the Council, shall be referred to the Committee on Appropriations, which shall investigate its merits and make a report to the Council at or before its next meeting. It shall be the further duty of this Committee to prepare and present to the Council for its approval at its October meeting each year a budget covering total estimated expenditures of the Association for the succeeding year.

Section 5. The Committee on Membership and Local Sections shall consist of the Vice Presidents and Secretary of the Association. This Committee shall examine and either approve or disapprove all applications for membership in the Association, before said applications are presented to the Council.

Section 6. The Publications Committee shall be appointed by the Council. This Committee shall have full charge of the publications of the Association including the annual Year Book and the preparation of its contents.

Section 7. The Committee on Corporate Memberships shall be appointed by the Council. It shall be the duty of this Committee to direct the solicitation of Corporate Memberships either directly or through the Corporate Membership Committees of the Local Sections; and to prepare and send to all Corporate Members annually a financial statement showing the disposition of Corporate Membership funds for research purposes, and a resume of the activities of the Research Committee.

Section 8. The Chairman of the Research Committee, subject to the approval of the Executive Committee on Research, shall appoint sub-committees as required from time to time to carry out specific research projects, such committees to be designated as "active sub-committees"; and also other sub-committees on various subjects to which inquiries may be referred, such committees to be designated as "reference sub-committees."

Each active sub-committee shall elect a Secretary and shall select a Chairman subject to the approval of the Executive Committee on Research. All active sub-committees shall report to the Research Committee at least once a year. No member may be Chairman of more than one active sub-committee at one time. No member may be a member of more than three active sub-committees at one time. No member may be Chairman of any active sub-committee more than three consecutive years, but an ex-chairman may become Chairman again after a lapse of one year.

Section 9. The Council or the President alone may appoint special committees, or chairmen with power to select the members of their committees, to perform specific duties.

Section 10. Every Standing and Special Committee shall report to the Council in a manner and at a time specified by the Secretary of the Association through proper notice to the Chairman.

Mr. Moorhouse was appointed Chairman of the Committee on Appropriations, and C. Z. Draves, L. A. Olney and P. J. Wood members. It was voted that the Committee on Color constitute, ex officio, the representation of the Association on the Inter-Society Color Council. Dr. Miles A. Dahlen was appointed Chairman of a committee to institute at the Atlantic City General Meeting a "Personnel Service," in accordance with his own recommendations. An appropriation was made for expenses. Mr. Barnard reported on the technical program for the meeting.

Mr. Little reported for the Executive Committee on Research. An appropriation was made for preparation of Corporate Membership certificates by the committee. There were submitted to letter ballot proposals to change the beginning of the Dues Year, for Corporate Members only, from Nov. 1 to Jan. 1; and to consider previous records of indebtedness for personal dues extinct on Nov. 1, 1944.

Elected to Corporate membership were, American Institute of Laundering, Archer Hosiery Mills, Better Fabrics Testing Bureau, Dundee Mills, Fair Lawn Finishing Co., Georgia Manufacturing Co., Grantville Mills, Griffin Hosiery Mills, Huguet Fabrics Corp., Industrial Dyeing Corporation of North Carolina, Jordan Mills, Lowell Bleachery South, Mock Jordan Voehringer Co., National Rayon Dyeing Co., Newnan Cotton Mills, North Georgia Processing Co., Phillipsburg Textile Print Works, Price Fire and Water Proofing Co., Russell Manufacturing Co., Schurmann Silk Dyeing Corp., Shannon Hosiery Mills, Spalding Knitting Mills, Stowe-Woodward, Inc., Waverly Piece Dye Works and Worcester Knitting Co.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SECRETARY'S FINANCIAL REPORT—JUNE 12, 1944

Received and transmitted to Treasurer	*Applications*	*Dues, regular & reinstate.*	*Dues, Corporate & Sustaining*	*Miscellaneous*	*Totals*
August 1, 1943 to April 14, 1944	$1,540.00	$12,992.63	$13.735.00	$4,107.76	$32,375.39
April 14 to June 12, 1944	445.00	567.00	2,052.50	459.82*	3,524.32
Total in fiscal year to date	1,985.00	13,559.63	15,787.50	4,567.58	35,899.71
Leaving deposited by Treasurer with Secretary			$2,000.00		

*Miscellaneous items,					
Year books	$105.80	Crock cloth	55.50	Knitted tubing	27.00
Reporters	77.05	Water test apparatus	24.20		460.04
Reprints	1.20	Dyed standards	14.00		— .22
Buttons	3.00	Gas fading blue prints	6.50		
Crockmeters	128.29	Moth cloth	17.50		$459.82

Senior

R. W. Angstadt	G. E. Landt
E. F. Arnold	N. R. Lufkin
G. A. Artope	K. V. Marshall
R. N. Aston	E. H. McAngus
C. A. Bachmeier	A. J. McGregor
G. L .Berry	M. C. Mobley
R. D. Broadhurst	D. B. Norton
J. A. Cairns	D. K. Ogles
M. Carrigan	A. R. Olsen
E. D. Cole	S. Parry
W. E. Coughlin	F. Phil
W. S. Curley	C. Piccione
E. M. Boppre	H. S. Porter
J. Diani	R. W. Price
G. Durand	R. T. Pullar
J. E. Durrell	G. R. Purdy
D. J. Eccleston	C. W. Rice
J. H. Eisenhardt	F. S. Richardson
P. M. Elliott	O. Ruitenberg, Jr.
J. S. Fassett	S. Scheibner
D. I. Gleim	E. W. Seasongood
E. A. Goetz	A. Seidel
G. C. Gregory	F. B. Smith
W. H. Gregory	F. J. Sprules
W. C. Hall	L. B. Stephenson
M. B. Hart	R. B. Taylor
G. T. Hodges, III	P. C. Thomas
C. C. Hollenbach	S. J. VanHaste
S. M. Howell, Jr.	A. P. Ventrella
J. W. Jordan	R. E. Ward
A. Kahn	J. L. Whisnant
J. H. Kettering	H. C. Whitehouse
W. H. Krewson	D. H. Wilcox, Jr.
R. J. LaBelle	L. C. Zumpfe

Junior

M. Crowther	W. T. Haggerty
A. J. Demers	R. S. Messinger
E. F. Glenn	F. Peterson
W. T. Grobe	

Associate

J. C. Alexander	C. F. MacNeil
T. P. Beery	R. V. May
C. W. Bendigo	G. R. Murphy
M. A. Bergfeld	H. R. Peterson
J. M. Besso	R. Rich
J. H. Canady	L. M. Shuford
J. M. Centa	T. R. Smith
W. R. Cleary	E. R. Templeton
R. D. Clevenger	M. D. Weiss
J. F. Hagen	F. S. Whiteside
E. C. Jertson	A. J. Wiesner
E. Kiesewetter	T. L. Woodwell

Transferred from other classifications to Senior membership were: F. A. Bateman, Jr., W. F. Biggers, J. H. Ciciva, J. R. Glennon, J. P. Ploubides, T. J. Scanlon, J. C. Shore.

Respectfully submitted,
HAROLD C. CHAPIN,
Secretary.

ONE HUNDRED AND THIRTY-NINTH MEETING OF THE RESEARCH COMMITTEE

THE Research Committee held its 139th meeting at the Downtown Athletic Club in New York on Tuesday morning, June 20th, 1944. Present were Chairman Louis A. Olney presiding, W. D. Appel, A. G. Ashcroft, K. H. Barnard, J. R. Bonnar, F. Bonnet, R. G. Buck, H. Christison, R. F. Culver, M. A. Dahlen, C. W. Dorn, W. C. Durfee, H. M. Hartnett, N. A. Johnson, D. P. Knowland, H. W. Leitch, L. S. Little, O. F. Marks, J. F. McCoy, J. E. Meili, W. R. Moorhouse, G. A. Moran, H. A. Neville, A. D. Nute, P. M. Otto, R. W. Philip, W. F. Prien, F. A. Prisley, C. N. Rabold, R. E. Rupp, B. A. Ryberg, C. H. A. Schmitt, C. A. Seibert, G. A. Slowinske, R. H. Souther, F. M. Steadman, J. A. Stevenson, H. W. Stiegler, F. R. Tripp, B. Verity, P. J. Wood, H. L. Young and H. C. Chapin.

Mr. Little reported for the Executive Committee on Research, with special reference to the budget, and efforts to determine the research interests of local Sections. Dr. Olney discussed new equipment and employees in Lowell, and named new sub-committee chairmen, Charles W. Dorn on Wash Fastness of Textiles, Charles A. Seibert on Fastness to Light, Albert H. Grimshaw on Standard Methods of Chemical Analysis and Testing, Ruby K. Worner on Bibliography, George A. Slowinske on Water Resistance of Fabrics, Carl W. Patton on Standard Methods of Determining Finishing Materials in Textiles, Harold W. Stiegler on Crease Resistance and Permanency of Finish on Fabrics, Daniel P. Knowland on Transference of Color, and James R. Redmond on Testing Fire Resistant Material.

Mr. Dorn described plans for large scale wash fastness tests in laundries and homes, on a variety of fabrics, under direction of a full-time assistant; on the basis of which the laboratory tests would be revised. Mr. Seibert was appointed Secretary of the Wash Fastness Committee. Mr. Seibert reported that recent work of the Light Fastness Committee had been principally on Mr. Christison's new standards, final samples of which would be ready for tests in about seven weeks. The committee was working on methods of evaluating fading rates of lamps.

On Water Resistance, Mr. Slowinske stated that the spray test was now officially standard and that the immersion test might also be so adopted, but that the hydrostatic test required further study, already in progress in a comparison with the Suter test. Tests simulating the effect of rain were under investigation in the du Pont laboratories as well as those of the Textile Foundation. Results were quite different from those with the hydrostatic test, thin, tightly woven fabrics standing the hydrostatic test better, and rain not so well, in comparison with other fabrics. Mr. Durfee suggested trial of single drops of water, from increasing elevations, up to the point of penetration.

Lt. Col. Steadman reported for Dr. Barker on a Mildew Proofing Test which it was hoped would be suitable for Federal specifications. Mr. Bonnar reported for Dr. Draves on the "Rewetting Test" for evaluating wetting agents, now nearly ready for official approval. Mr. Barnard reported the current status of plans for extensive work on accelerated ageing tests by various organizations. Mr. Knowland stated that some of the multifiber test fabric was about ready for shipment. Mr. Marks suggestion of a test for susceptibility of fibers to snagging was referred to the Executive Committee on Research.

Dr. Dahlen said that a test with sand paper was fairly satisfactory.

It was voted that the method of testing color fastness to laundering and domestic washing of dyed or printed cotton and linen, being in process of revision, be withdrawn from consideration by the American Standards Association as an American Standard; and that request be made to the American Standards Association that the document on, "Color Fastness Terminology for Colored Textiles," submitted to the Federal Trade Commission in October, 1942, be referred back to our Association as a co-sponsor, pending revision of tests now in progress. Mr. Christison, Mr. Durfee and Mr. Moorhouse were appointed a committee to reconcile terminology of certain tests in the Year Book with CS-59.

Respectfully submitted,
HAROLD C. CHAPIN,
Secretary.

COMMITTEES FOR ANNUAL MEETING

General Chairman—C. A. SEIBERT

TECHNICAL PROGRAM COMMITTEE

Dr. Glen S. Hiers, Chairman; Lt.-Col. Frank Steadman, Vice-Chairman; John A. Levering, Roy Hobart Souther, Charles W. Dorn and Miles A. Dahlen.

REGISTRATION AND RESERVATION

Harold B. Dohner, Chairman; Curt Baeringer, Vice-Chairman, and A. E. Raimo.

FINANCE COMMITTEE

Fred C. Scholler, Chairman; Max Ritter, Walter Fancourt and Arthur E. Jones.

EXHIBITION COMMITTEE

Arthur Etchells, Chairman; Capt. A. W. Edwards, M. H. Klein and B. S. Bellemere.

PUBLICITY COMMITTEE

Walter G. Hamlen, Chairman; Joseph Schmitz, Jr., and William Diamond.

BANQUET COMMITTEE

De Haven Butterworth, Chairman; John H. Culver and Walter Fancourt, 3rd.

ENTERTAINMENT COMMITTEE

James P. Conaway, Chairman; Ernest Empting, W. R. Smith and Ernest Burrell.

RECREATION COMMITTEE

Lloyd Koons, Chairman; Arthur M. Gordon, Vice-Chairman; John W. Jordan, Richard L. Jones and John Koch, Jr.

RECEPTION COMMITTEE

Harry M. Hartnett, *N.N.E. Section;* A. R. Fletcher and H. S. Travis, *R. I. Section;* J. E. Meili and N. A. Johnson, *N. Y. Section;* J. L. Crist and C. N. Rabold, *Piedmont Section;* W. B. Griffin and R. W. Philip, *S. Eastern Section;* R. W. Freeze, *S. Central Section;* A. T. Brainerd, *Mid-West Section;* C. Baeringer, H. B. Dohner and A. E. Raimo, *Phila. Section.*

TRANSPORTATION COMMITTEE

John F. McCoy, Chairman; Edward G. Haack, Frank E. Nevins and Roland MacDonald.

LADIES' COMMITTEE

James Dixon, Chairman; F. L. Pepper, James C. Conway, Mrs. Harry P. Millson and Mrs. Wm. Ebersold.

TENTATIVE PROGRAM FOR ANNUAL MEETING

THURSDAY, OCTOBER 12TH

12:00 M.—Registration
Research Sub-committee Meetings
Council Meeting
The personal relations program will be active from the time of registration until 5 or 6 P.M. Saturday evening

FRIDAY, OCTOBER 13TH

9:00 A.M.—Registration continued
10:00 A.M.—Research Committee Meeting
2:00 P.M.—Symposium on "The Textile Chemist in the Post-War World" William D. Appel, presiding

1. Introductory Remarks
William D. Appel
2. The Undergraduate Course in Textile Chemistry, Dr. Samuel C. Lind
3. Postgraduate Training and Research for Textile Chemists, Dr. Hugh S. Taylor
4. The Professional Status of the Textile Chemist, Andrew Fraser, Jr.

5:00 P.M.—Annual Business Meeting
7:00 P.M.—Buffet Supper
Intersectional Contest

SATURDAY, OCTOBER 14TH

9:30 A.M.—Technical Papers

Testing Group—C. E. Dorn, Chairman

1. Service Testing of Textile Materials
Dr. Jules LaBarthe
2. Interpretation of Laboratory Tests
Alfred G. Ashcroft
3. Writing of Specifications for Textile Materials, Col. Frank M. Steadman
4. Consumer Protection in Informative Labeling, Earle M. Edgerton

Cotton Group—Douglas C. Newman, Chairman

1. Recent Developments in Dyeing of Cotton Fabrics with Vat Dyes
2. Some Aspects of the Degradation of Cellulose in Storage and Service, A. J. Rutherford
3. Pigment Dyeing and Printing
4. Recent Developments in Drying of Textile Materials

Wool Group—Dr. Milton Harris, Chairman

1. The Present State of Synthetic Protein Fiber Development, Dr. Orville May
2. Continuous Dyeing of Wool
Werner von Bergen
3. Survey of Shrinkproofing Processes
4. Evaluating of Shrinkproofing Methods

Finishing Group—Dr. Donald H. Powers, Chairman

1. General Survey of New Resinous Finish Materials on Various Fibers and Fabrics, Dr. D. H. Powers
2. Hosiery Finishing
3. Analysis and Control of Tropical Damage, Prof. Wm. N. Weston
4. Insect Pest Control

Synthetic Fibers Group—Dr. H. D. W. Smith, Chairman

1. Survey of the New Synthetic Fibers
Wm. D. Appel
2. Synthetics in Post-War Fabrics
3. A Survey of the Dyeing of Synthetic Fibers, Arthur W. Etchells
4. The Use of Synthetic Fibers in Knitted Fabrics

1:00 P.M.—Luncheon Meeting, National and Section Officers
Recreation
7:30 P.M.—Banquet
Olney Medal Award

Note: This program subject to revision and change

A. A. T. C. C.

PERSONNEL SERVICE
Atlantic City Meeting
October 12-14, 1944

Candidates for Employment:

Write to Dr. H. C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass., for application forms or secure them at the meeting.

Employers:

Advise Dr. Chapin of your interest and personnel requirements now, if possible. If not, consult the Service at the meeting.

For further information, see July 31, 1944, issue of
AMERICAN DYESTUFF REPORTER

This service is free to all A.A.T.C.C. members!

THE UTILIZATION OF WOOL

By Four Saprophytic Micro-Organisms in the Presence of Additional Nutrients

DORIS J. HIRSCHMANN,[1] MARIAN ZAMETKIN,[2] and RUTH ELMQUIST ROGERS[3]

Bureau of Human Nutrition and Home Economics, Agricultural Research Administration,, U. S. Department of Agriculture

DURING war time, clothing and other articles made from wool, especially those used by troops, are more likely to be exposed to conditions favoring microbial decay than normally, and replacements for damaged materials are more difficult to obtain. The study herein reported was undertaken to investigate some aspects of the mechanism of this decay. To do this the growth of four saprophytic micro-organisms which utilize wool as a nutrient was investigated in the presence and absence of degreased wool fabric. Various media with and without sources of nitrogen and/or of carbon were used. Also the effect of adding an aqueous wool extract to the various media was determined. It is hoped that the information in this report may prove useful in any subsequent investigations designed to study the protection of wool against decay and to develop methods to test the adequacy of these various protective measures.

REVIEW OF THE LITERATURE

A few investigators have found that under certain conditions some micro-organisms use wool and other animal hair as a source of nutrient. Rogers, Hirschmann, and Humfeld (13) reported that *Trichophyton interdigitale* grew on and utilized sterilized wool fabric as a source of nutrient in the presence of mineral salts agar or water agar. Stuart (14) stated that *Chaetomium globosum* utilized heat-sterilized calf hair as the sole source of carbon and nitrogen.

Burgess has shown that growth of organisms on wool is influenced by the degree of deterioration of wool and by the presence of impurities. He (2, 4) reported that a partial hydrolysis of the wool protein may cause an enhancement of growth due to an increase in available nutrient. According to him (3) wool may contain impurities as an available food supply on which the organisms grow before the fibers themselves are attacked. Burgess (5) also stated that in the presence of certain nutrients other than wool, the range of temperature and humidity is increased within which the growth of organisms on wool is possible.

Investigators have found that wool fibers can be disintegrated into their component parts by micro-organisms and in the absence of living organisms, by the enzyme, trypsin. Gabriel (9) reported that an unidentified organism causing "pink rot" in wool retted the fiber. He stated that the by-products of the organism appeared to attack the substance holding the cells of the fiber together. According to Trotman and Sutton (15), cortical cells were liberated from wool inoculated with *Bacillus mesentericus* or *Bacillus subtilis* when incubated in nutrient broth. Burgess (6, 7) showed that buffered solutions of trysin could disintegrate wool fibers into their component parts in the absence of living organisms but pointed out that in general wool showed good resistance to tryptic action and that the penetration of sound fiber was slow. The action of the enzyme, trypsin, on wool fiber was similar to but more rapid than that of proteolytic bacteria.

MATERIALS AND METHODS

The extent of growth of *Bacillus mesentericus, Bacillus subtilis, Actinomyces albus* variety and *Chaetomium globosum,* on wool fabric was determined in the presence of four liquid and four solid media. These four organisms[4] were chosen because previous reports by others, and preliminary work performed in this laboratory, indicated that these organisms were capable of damaging wool or attacking hair. *B. mesentericus* and *B. subtilis* were reported to attack wool by Trotman and Sutton (15). *A. albus* was isolated by one of the authors from wool and subsequently grown on water-agar containing sterilized ground wool. *C. globosum* was found by Stuart (14) to attack calf-hair keratin.

The liquid media used were Czapek's solution[5], Czapek's with sucrose omitted, Czapek's with $NaNO_3$ omitted, and Czapek's with both sucrose and $NaNO_3$ omitted. The solid media were the same as the four liquid media except that each one contained 1.5 per cent agar[6] in addition to the other substances. Distilled water was used as the control for the liquid media and water agar for the solid media. In addition, experiments were made in which an aqueous wool extract was substituted for the wool fabrics, and added to the liquid media.

The various media and the controls were adjusted to pH 7.0 by the addition of 1N NaOH or 1N HCl, as necessary. Adjustments were made colorimetrically using bromthymol blue as the indicator. None of the media was filtered. They were sterilized in the autoclave at 15 pounds pressure for 20 minutes.

The fabric used was a clear finished, bleached, all-wool, 2-up-and-2-down eventwill serge. It was degreased by extracting 6 hours with alcohol, air drying, extracting 6 hours with ether, air drying, and thoroughly rinsing in distilled water at 50° C.

The degreased fabric was cut into rectangular pieces ½ x 2 inches. Each piece was rinsed in running distilled water for 30 minutes and then placed in a separate test tube and sterilized at 15 pounds for 20 minutes.

Rapidly growing cultures were used in preparing the inocula. *B. mesentericus* and *B. subtilis* were sub-cultured daily, *A. albus* at 2-day intervals, and *C. globosum* at weekly intervals. Nutrient agar slants were used for growing the organisms and in each case the third sub-culture was taken.

The growth from three agar slants of each organism was removed and suspended in distilled water. The suspension was

[1] Present address: Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

[2] Now at National Bureau of Standards, U. S. Department of Commerce..

[3] Present address: College Heights Estates, Md.

[4] Appreciation is expressed to N. R. Smith of the U. S. Bureau of Plant Industry, Soils and Agricultural Engineering for the cultures of B. mesentericus and B. subtilis. The A. albus culture was isolated in the bacteriological laboratories of the Bureau of Human Nutrition and Home Economics as a contaminating organism growing on wool fabric. It was identified by S. A. Waksman, of the New Jersey Agricultural Experiment Station. The strain of C. globosum was isolated by H. Humfeld, formerly of the U. S. Bureau of Plant Industry, Soils and Agricultural Engineering from mildewed canvas and identified from Chivers' monograph (8). The culture was subsequently sent to Chivers, who confirmed the identification.

[5] The formula for Czapek's solution is: $MgSO_4$, 0.5 gm.; KCl, 0.5 gm; K_2HPO_4, 1.0 gm; $FeSO^4$, 0.01 gm; $NaNO_3$, 2.0 gm; sucrose, 30.0 gm; distilled water, 1 liter. Although the chemicals used were analyzed reagent quality, traces of nitrogen were present as impurities.

[6] Difco agar was used throughout this study.

transferred to an Erlemeyer flask containing sterile glass beads and thoroughly shaken by hand for 15 to 30 minutes until all large clumps were broken up and a milky suspension formed. It was centrifuged at approximately 1200 R.P.M., the supernatant fluid removed, and the cells resuspended in sterile distilled water and again centrifuged. This washing process was repeated two additional times. After the final centrifuging, the bacterial or fungal cells were suspended in 20 ml. of sterile distilled water.

Five milliliters of each of the liquid media were pipetted into each of ten sterile tubes, half of which contained wool pieces. The wool was thoroughly moistened by the medium and allowed to remain partially submerged.

Each of the solid media was melted, cooled to approximately 50° C. and poured into 10 Petri dishes, 20 ml. per dish. After the agar solidified a wool piece was added to each of five plates of each medium. The strip was placed in firm contact with the agar, without breaking the surface of the agar. In the case of *B. mesentericus* and *B. subtilis*, the experiment was repeated using test tubes in place of Petri dishes.

In order to verify the sterility of the media and wool, all tubes and plates were incubated for 2 days at 30° C. before inoculation.

Each fabric piece was inoculated with 0.1 ml. of the washed suspension of one of the four organisms, care being taken to spread the inoculum over the entire surface of the wool. The excess was allowed to run from the fabric edge onto the medium. Each tube of medium without wool was also inoculated with 0.1 ml. of suspension.

All cultures were incubated at 30° C. for three weeks. Observations of growth on the fabric and on the media were made periodically. At the end of the incubation period, fibers from the various samples of fabric were examined microscopically, using the 16 mm. and 4.4 mm. objectives.

In addition to the work described above, the effect of a wool extract[2] on the growth of the four organisms was tested. For each organism, 5 ml. of each medium containing 0.5 ml. of extract was dispensed in each of 5 sterile test tubes and incubated at 30° C. for 48 hours before use. One-tenth of a ml. of the culture suspension prepared as previously described, was used to inoculate each tube. Two control tubes of each of the four basic media and the distilled water, without any wool extract, were inoculated with each organism. Macroscopic examinations were made after 3, 7, 14 and 21 days of all the inoculated tubes and microscopic examinations only when there was any doubt about the presence of growth.

RESULTS

Bacillus mesentericus

Bacillus mesentericus grew in Czapek's solution and Czapek's agar without the addition of wool fabric or wool extract (table I). In general there was scant development in the incomplete Czapek's media. Water agar supported no or only scant growth of the organism and distilled water no growth.

When the wool fabric was added to the Czapek's and incomplete Czapek's solutions, development of the organism in the media was markedly stimulated, and after two weeks, scant growth occurred even in the distilled water in which the wool was submerged. However, colonies of the bacillus were not evident on the various fabric pieces.

Stimulation of growth was noted when the wool extract was added to the liquid media. This stimulation occurred with

[2] A 10-square-inch piece of the wool fabric was used to prepare the wool extract. The fabric was finely shredded, added to 200 ml. of distilled water, and autoclaved at 15 pounds for 20 minutes. After standing over night, the mixture was filtered through paper with sterile precautions. The filtrate, a clear, faintly yellow, slightly viscid fluid, was tested for sterility on nutrient agar. It was added, in 20-ml. amounts, to 200 ml. of each of the four basic liquid media and to the distilled water. The final concentration of the extract in the media was approximately equivalent to the extract of one ½ x 2 inch piece per 5 ml. of medium.

TABLE I

Growth of Bacillus mesentericus in various media with and without wool[1]

Media	Growth in absence of wool				Growth in presence of wool						
					On fabric			In surrounding media or extract			
	3 days	7 days	14 days	21 days	7 days	14 days	21 days	3 days	7 days	14 days	21 days
Liquid media											
Czapek's solution	4+	4+	4+	—	—	—	...	6+	6+	6+	
Czapek's solution without sucrose	1+	1+	1+	—	—	—	...	2+	4+	4+	
Czapek's solution without sodium nitrate	±	1+	1+	—	—	—	...	4+	5+	5+	
Czapek's solution without sucrose and sodium nitrate	±	1+	1+	—	—	—	...	2+	4+	5+	
Distilled water	—	—	—	—	—	—	...	±	1+	1+	
Agar media (Petri plate)											
Czapek's agar	6+	6+	6+	—	—	—	...	6+	6+	6+	
Czapek's agar without sucrose	1+	1+	1+	—	—	—	...	1+	1+	1+	
Czapek's agar without sodium nitrate	2+	3+	3+	—	—	—	...	2+	3+	3+	
Czapek's agar without sucrose and sodium nitrate	1+	1+	1+	—	—	—	...	1+	1+	1+	
Water agar	1+	1+	1+	—	—	—	...	1+	1+	1+	
Agar media (Test tube)											
Czapek's agar	6+	6+	6+	2+	2+	2+	...	6+	6+	6+	
Czapek's agar without sucrose	1+	1+	1+	—	—	—	...	1+	1+	1+	
Czapek's agar without sodium nitrate	2+	2+	2+	—	—	—	...	2+	2+	2+	
Czapek's agar without sucrose and sodium nitrate	1+	1+	1+	—	—	—	...	1+	1+	1+	
Water agar	—	—	—	—	—	—	...	—	—	—	
Liquid media—aqueous wool extract											
Czapek's solution	2+	2+	2+	2+	...	...	...	4+	4+	4+	4+
Czapek's solution without sucrose	1+	2+	2+	2+	...	...	...	2+	3+	3+	3+
Czapek's solution without sodium nitrate	2+	2+	2+	2+	...	...	...	4+	4+	4+	4+
Czapek's solution without sucrose and sodium nitrate	1+	1+	1+	1+	...	...	...	2+	2+	2+	2+
Distilled water	—	—	—	—	...	...	...	1+	1+	1+	1+

[1] Growth on 5 samples averaged and reported as follows: — = no growth; ± = doubtful growth; 1+ = scant growth; 2+ = fair growth; 3+ = moderate growth; 4+ = good growth; 5+ = very good growth; and 6+ = excellent growth.

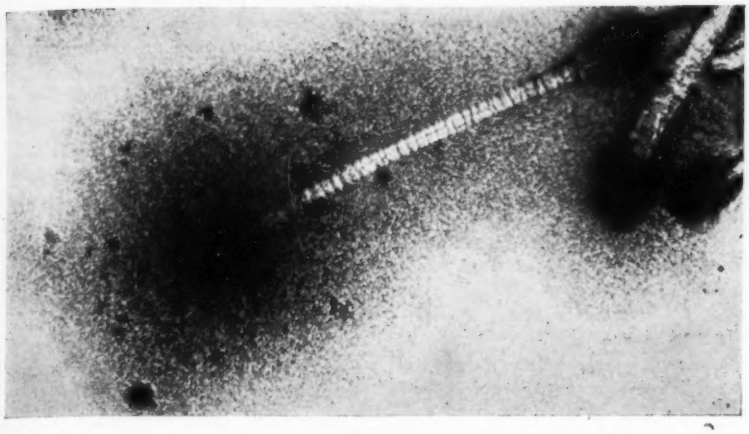

Figure 1.—Stimulation of growth of Bacillus mesentericus around the cut edges of fibers taken from the wool fabric incubated on Czapek's agar with sucrose and $NaNO_3$ omitted. x 150.

each medium and at every observation period.

When the fabric was added to the solid media, microscopic examinations revealed a marked stimulation of growth at the ends of cut fibers on all media (Fig. 1). However, there were no visible colonies on the fabric itself except on the Czapek's agar in the test tube experiment.

Microscopic examination of fabric samples removed from the various media and the water agar showed that most of the fibers were normal. Occasional fibers with faint epithelial scales and striated appearance or very occasional free cortical cells were observed in all the fabric pieces except those incubated in distilled water. The latter appeared normal. When examined microscopically, uninoculated wool which had been sterilized and incubated as test pieces also appeared normal.

Bacillus subtilis

As shown in Table II, growth of *Bacillus subtilis* as well as of *B. mesentericus* was supported by Czapek's solution and Czapek's agar without the addition of wool fabric or extract. In general limited development occurred in the incomplete Czapek's media. The Czapek's medium without the nitrogen source supported more growth than that without the carbon source. There was scant or no evidence of development of colonies of the bacillus on water agar and none in distilled water.

When the wool fabric was partially immersed in the liquid media growth of the organisms in the media was either initiated or stimulated. However, development on the fabric surface occurred only in the presence of full Czapek's solution.

The addition of the wool extract to the Czapek's and incomplete Czapek's solutions stimulated growth. It permitted the bacillus to grow when added to distilled water.

When wool was placed on the solid media, no visible colonies occurred on the fabric, except in the presence of Czapek's agar in which case growth appeared to cover the fabric surface. Although no marked increase in colony development, as judged by visual observation, occurred on any of the solid media to which wool fabric was added, microscopic examina-

TABLE II
Growth of Bacillus subtilis in various media with and without wool[1]

Media	*Growth in absence of wool*				*Growth in presence of wool*					
					On fabric			*In surrounding media or extract*		
	3 days	*7 days*	*14 days*	*21 days*	*7 days*	*14 days*	*21 days*	*3 days*	*7 days*	*14 days*	*21 days*
Liquid media											
Czapek's solution	5+	6+	6+	6+	6+	6+	...	6+	6+	6+	
Czapek's solution without sucrose	±	±	±	—	—	—	...	2+	2+	3+	
Czapek's solution without sodium nitrate	±	1+	4+	—	—	—	...	5+	6+	6+	
Czapek's solution without sucrose and sodium nitrate	—	—	—	—	—	—	...	2+	2+	4+	
Distilled water	—	—	—	—	—	—	...	±	±	1+	
Agar media (Petri plate)											
Czapek's agar	6+	6+	6+	6+	6+	6+	...	6+	6+	6+	
Czapek's agar without sucrose	1+	2+	2+	—	—	—	...	2+	2+	2+	
Czapek's agar without sodium nitrate	2+	3+	4+	—	—	—	...	3+	4+	4+	
Czapek's agar without sucrose and sodium nitrate	2+	2+	2+	—	—	—	...	2+	2+	2+	
Water agar	1+	1+	1+	—	—	—	...	2+	2+	2+	
Agar media (Test tube)											
Czapek's agar	6+	6+	6+	6+	6+	6+	...	6+	6+	6+	
Czapek's agar without sucrose	2+	2+	2+	—	—	—	...	2+	2+	2+	
Czapek's agar without sodium nitrate	3+	3+	3+	—	—	—	...	3+	4+	4+	
Czapek's agar without sucrose and sodium nitrate	2+	2+	2+	—	—	—	...	2+	2+	2+	
Water agar	—	—	—	—	—	—	...	1+	1+	1+	
Liquid media—aqueous wool extract											
Czapek's solution	1+	2+	4+	4+	...	...	...	6+	6+	6+	6+
Czapek's solution without sucrose	+	1+	1+	1+	...	...	...	2+	2+	2+	2+
Czapek's solution without sodium nitrate	1+	2+	2+	2+	...	...	...	3+	4+	4+	4+
Czapek's solution without sucrose and sodium nitrate	+	1+	1+	1+	...	...	...	2+	2+	2+	2+
Distilled water	—	—	—	—	...	...	...	2+	2+	2+	2+

[1] Growth on 5 samples averaged and reported as follows: — = no growth; ± = doubtful growth; 1+ = scant growth; 2+ = fair growth; 3+ = moderate growth; 4+ = good growth; 5+ = very good growth; and 6+ = excellent growth.

tion revealed stimulation of growth at the ends of cut fibers. A similar stimulation was found for *B. mesentericus.*

Microscopic examination of fabric samples removed from Czepak's medium showed many descaled fibers and abundant free epithelial and cortical cells. The remaining fabric pieces except those incubated in distilled water revealed mostly normal fibers although occasional descaled fibers and a limited number of free cortical cells were observed. The fibers in distilled water appeared normal.

Actinomyces albus variety

Growth of *Actinomyces albus* variety was excellent in Czapek's solution and Czapek's agar after 2 weeks (table III). At the end of the incubation period, the growth in the incomplete Czapek's solutions ranged from doubtful to fair and on the incomplete agar, moderate to good. The medium without the source of nitrogen afforded better development of the organism than that without the carbon source as was found in the case of *B. subtilis.* Water agar supported fair but distilled water no growth. In general there was more development on the solid than in the liquid media.

When wool fabric was added to the incomplete solutions, growth was greatly stimulated in the surrounding media and a scant growth was obtained by adding the wool fabric to distilled water. Excellent development occurred on the fabric itself in the presence of Czapek's solution and in all but one case in the presence of the incomplete solutions. *A. albus* did not grow on the fabric in distilled water.

The addition of wool extract stimulated the growth of the organisms in each liquid medium.

When wool was added to the solid media, growth on the agar was not stimulated except in the case of water agar. In general the development was more abundant on the fabric than on the surrounding agars. The growth on the fabric in the presence of Czapek's agar was excellent, in the presence of the incomplete agars, good to very good, and in the presence of the water agar, fair to good.

Microscopic examination showed extreme deterioration of the wool fibers in all cases except when the wool was incubated in the presence of distilled water. Most of the fibers examined were descaled and disintegrated and there were many free cortical cells. With distilled water the fibers appeared the same as those from the uninoculated wool.

Chaetomium globosum

According to Table IV, Czapek's solution and Czapek's agar supported fair to good growth of *Chaetomium globosum,* the incomplete media scant to good, and water agar scant to fair growth. The fungus grew better in the media without the source of nitrogen than without the source of carbon.

In the distilled water controls, a scant growth of *C. globosum* was obtained in each replicate test in the experiment in which the wool fabric was added to various liquid media but doubtful growth in the experiment with the aqueous wool extract. This scant growth might possibly have been caused by traces of nutrients in the distilled water or possibly by traces carried over with the cells used to inoculate the water. The cells themselves may have contained sufficient stored products to multiply at least once.

The addition of wool fabric usually stimulated the growth of *C. globosum* in the incomplete Czapek's solutions and in distilled water. Fair to good growth, with sporulation, occurred on the wool fabric in the presence of full Czapek's solution and the incomplete solutions. A scant to fair growth, with some sporulation, was observed on the fabric in the presence of distilled water only.

When the wool extract was added to the various solutions and to distilled water, development was enhanced in each liquid at each observation period.

More abundant growth occurred on the wool fabric plated on the agar media than on the surrounding media as was found in general for *A. albus.* Figure 2 shows the greater amount of *C. globosum* on the wool on the Czapek's agar without sucrose and $NaNO_3$ than on this agar in the absence of wool. Moderate to excellent growth also with sporulation was noted on the fabric in the presence of Czapek's and the incomplete agars and scant to very good on the water agar.

Microscopic examination of the wool showed deterioration of the fibers when incubated on Czapek's and the incomplete Czapek's media. Most of the fibers examined had only faintly visible scales and some showed greater disintegration. Some cortical cells were present. The

TABLE III

Growth of Actinomyces albus variety in various media with and without wool[1]

Media	Growth in absence of wool				Growth in presence of wool						
					On fabric			In surrounding media or extract			
	3 days	7 days	14 days	21 days	7 days	14 days	21 days	3 days	7 days	14 days	21 days
Liquid media											
Czapek's solution	2+	6+	6+	6+	6+	6+	...	4+	6+	6+	
Czapek's solution without sucrose	±	1+	1+	6+	6+	6+	...	6+	6+	6+	
Czapek's solution without sodium nitrate	±	1+	2+	5+	6+	6+	...	4+	6+	6+	
Czapek's solution without sucrose and sodium nitrate	1+	1+	1+	6+	6+	6+	...	4+	6+	6+	
Distilled water	—	—	—	—	—	—	...	1+	1+	1+	
Agar media (Petri plate)											
Czapek's agar	6+	6+	6+	6+	6+	6+	...	6+	6+	6+	
Czapek's agar without sucrose	3+	3+	3+	4+	4+	5+	...	3+	3+	3+	
Czapek's agar without sodium nitrate	4+	4+	4+	4+	5+	5+	...	4+	4+	4+	
Czapek's agar without sucrose and sodium nitrate	3+	3+	3+	4+	5+	5+	...	3+	3+	3+	
Water agar	2+	2+	2+	2+	3+	4+	...	2+	3+	3+	
Liquid media—aqueous wool extract											
Czapek's solution	1+	2+	6+	6+	...	...	...	6+	6+	6+	6+
Czapek's solution without sucrose	±	±	±	±	...	...	...	2+	2+	2+	2+
Czapek's solution without sodium nitrate	±	1+	2+	2+	...	...	...	4+	4+	4+	4+
Czapek's solution without sucrose and sodium nitrate	±	±	1+	1+	...	...	...	2+	2+	2+	2+
Distilled water	—	—	—	—	...	...	...	2+	...	...	...

[1] Growth on 5 samples averaged and reported as follows: — = no growth; ± = doubtful growth; 1+ = scant growth; 2+ = fair growth; 3+ = moderate growth; 4+ = good growth; 5+ = very good growth; and 6+ = excellent growth.

TABLE IV

Growth of Chaetomium globosum in various media with and without wool[1]

Media	Growth in absence of wool				Growth in presence of wool						
					On fabric			In surrounding media or extract			
	3 days	7 days	14 days	21 days	7 days	14 days	21 days	3 days	7 days	14 days	21 days
Liquid media											
Czapek's solution	3+	4+	4+	[2]2+	[2]3+	[2]4+	...	4+	4+	4+	
Czapek's solution without sucrose	1+	1+	2+	[2]2+	[2]3+	[2]4+	...	4+	4+	4+	
Czapek's solution without sodium nitrate	2+	2+	4+	[2]2+	[2]3+	[2]4+	...	4+	4+	4+	
Czapek's solution without sucrose and sodium nitrate	1+	1+	2+	[2]2+	[2]3+	[2]3+	...	4+	4+	4+	
Distilled water	1+	1+	1+	1+	[2]1+	[2]2+	...	2+	4+	4+	
Agar media (Petri plate)											
Czapek's agar	2+	[2]3+	[2]3+	[2]4+	[2]6+	[2]6+	...	3+	3+	3+	
Czapek's agar without sucrose	1+	2+	[2]2+	[2]4+	[2]6+	[2]6+	...	2+	2+	2+	
Czapek's agar without sodium nitrate	2+	[2]3+	[2]3+	[2]4+	[2]6+	[2]6+	...	2+	3+	3+	
Czapek's agar without sucrose and sodium nitrate	1+	2+	[2]2+	[2]3+	[2]6+	[2]6+	...	2+	2+	2+	
Water agar	1+	1+	[2]2+	[2]2+	[2]5+	[2]5+	...	2+	2+	2+	
Liquid media—aqueous wool extract											
Czapek's solution	2+	2+	[2]2+	[2]2+	...	...	...	3+	4+	[2]4+	[2]4+
Czapek's solution without sucrose	1+	1+	[2]1+	[2]2+	...	...	...	2+	3+	[2]4+	[2]4+
Czapek's solution without sodium nitrate	2+	2+	[2]2+	[2]4+	...	...	...	3+	4+	[2]5+	[2]6+
Czapek's solution without sucrose and sodium nitrate	1+	1+	[2]1+	[2]1+	...	...	...	2+	3+	[2]4+	[2]4+
Distilled water	±	±	±	±	...	...	...	2+	2+	[2]2+	[2]3+

[1] Growth on 5 samples averaged and reported as follows: — = no growth; ± = doubtful growth; 1+ = scant growth; 2+ = fair growth; 3+ = moderate growth; 4+ = good growth; 5+ = very good growth; and 6+ = excellent growth.

[2] Sporulation noted.

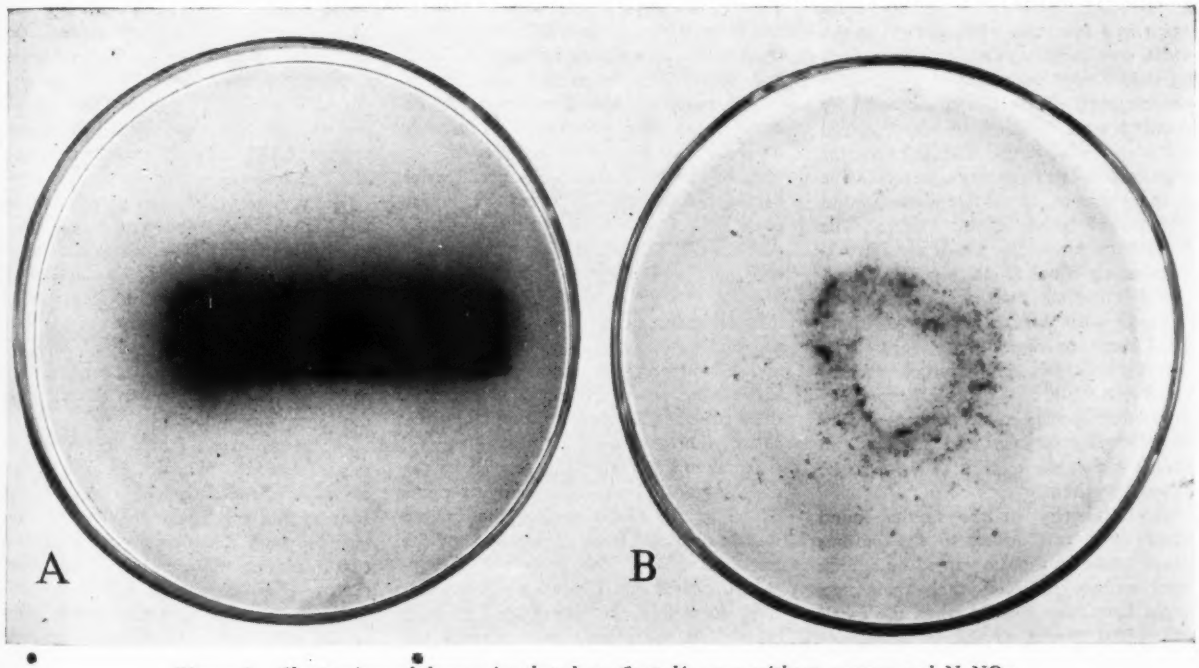

Figure 2. Chaetomium globosum incubated on Czapek's agar without sucrose and $NaNO_3$: A, in the presence of wool; B, in the absence of wool.

fibers incubated on water agar and in distilled water were less deteriorated than those incubated with the other media.

DISCUSSION

Degreased, steam-sterilized wool fabric was found to resist attack by three of the four test organisms except in the presence of added nutrients. Only one organism, *Chaetomium globosum*, was able to grow on the wool fabric in the presence of only distilled water. However, there was even a scant growth of this organism in distilled water alone.

The growth of *C. globosum* on wool using water agar medium or Czapek's agar without sucrose and sodium nitrate is in accord with the finding of Stuart (14) that this fungus utilized heat-sterilized calf hair on an agar medium containing no source of carbon or nitrogen.

In general, *Actinomyces albus* variety caused more fiber deterioration than the other test organisms. It grew on wool and caused severe fiber damage in the presence of Czapek's and incomplete Czapek's substrates and water agar. Only

with distilled water did this organism fail to grow on wool and fail to cause fiber damage.

Growth of *Bacillus subtilis* on wool was obtained only in the presence of complete Czapek's solution and agar and of *Bacillus mesentericus* only with the Czapek's agar in the test tube experiment. Neither organism grew on wool when the incomplete substrates were used. Trotman and Sutton (15) reported greater damage to wool by these organisms than that found in this study. However, these organisms may utilize wool more readily in the presence of the organic nitrogen in the nutrient broth used by Trotman and Sutton than in the presence of the inorganic nitrogen of Czapek's medium.

Although wool was found to be resistant to attack by three of the four test organisms in the absence of added nutrient, the addition of wool initiated growth in the media surrounding the fabric in some cases and stimulated growth in many other instances. All four organisms grew in the surrounding fluid when wool was added to distilled water.

Wool extract obtained by steaming the wool fabric either initiated or stimulated growth when added to the various media except in a few cases when growth in the media was already excellent. This finding is in accord with that of Burgess (2) who reported that a filtrate obtained by steaming wool in distilled water served as a nutrient for fungi. This initiation or stimulation of growth was apparently due to the presence of soluble deterioration products of wool in the extract. The sterilization procedure caused some breakdown of the wool. Moreover this fabric, like all other materials, was undoubtedly damaged even before it was sterilized. Wool fibers are injured somewhat by such factors as ultraviolet light and mechanical action while still on the sheep. They are further harmed to some extent during manufacture into yarns and fabrics. Even storage causes the quality of wool to be slowly impaired.

The similarity in the results found when wool was added to the various liquid media to those obtained by adding wool extract indicates that an extract might have been formed when the fabric was added to the media. It is possible that some of the hydrolytic products produced during sterilization dissolved in the media, thus forming a readily utilizable nutrient source.

In general, Czapek's media without wool supported good or excellent growth of the organisms, and the incomplete media without wool, scant to good growth.

There was more development of the various test organisms in the Czapek's media without the $NaNO_3$ than in the media without the sucrose. Trace amounts of nitrogen are present in reagent chemicals and in the agar used as well as in the original inoculum. It is more difficult to obtain a nitrogen-free media than one carbohydrate-free. Trace amounts of nitrogen in the substrate in which $NaNO_3$ was omitted may explain the good growth with this medium.

In most instances an increased development occurred in the incomplete media to which agar had been added as a solidifying base over that in the corresponding solutions. For example, water agar in general supported a scant growth of the four test organisms. However, distilled water, except in the case of *C. globosum*, did not permit growth. It is assumed that unknown nutrients in the agar caused the increased development. These results with agar are similar to some data recently reported by Greathouse, Klemme, and Barker (11) who found that cotton strips inoculated with *C. globosum* and incubated on water agar yielded a significantly higher loss in breaking strength than those incubated on distilled water.

The mode of diffusion of the available nutrient from the wool fabric was indicated by the experiments with *B. subtilis* and *B. mesentericus* on solid media. When wool fabric was placed on Czapek's agar and the various incomplete solid media, it was noted by low power microscopic examination that stimulation of growth of the above organisms occurred at the ends of the cut fibers. Such preferential development was also noted by Stuart (14) who found that perithecia of *C. globosum* developed on the cut ends of calf hair and suggested that this may indicate that the cut ends of animal hairs may be more susceptible to attack than the undisturbed surfaces. Bergmann (1) and Grassman (10) found that animal fibers were more actively hydrolyzed at their cut ends by enzymes than along the rest of the surface.

It seems likely that the growth of the micro-organisms was initiated by nutrients added to the media and/or the soluble extract obtained from the cut ends of the sterilized fibers. The growth thus supported caused the liberation of enzymes and formation of metabolic products which, in turn, may have altered the fiber structurally and chemically, predisposing it to subsequent disintegration. Altered fiber is more readily attacked than sound wool.

The examination of the structure of the fibers from the fabric on which the micro-organisms grew revealed that the epithelial scales were removed first and that the cortical cells were isolated later. According to Prindle (12) a protein-cementing substance that can be digested by trypsin may bind the cellular contents of wool.

The chemical stability of keratin is attributed to the disulfide linkage. It is possible that micro-organisms first reduce this linkage in their attack on wool. Stuart (14) found that *C. globosum* reduced the sulfur groups in keratose, a hydrolytic product of keratin.

SUMMARY AND CONCLUSIONS

The growth of four saprophytic micro-organisms, *Bacillus mesentericus, Bacillus subtilis, Actinomyces albus* variety and *Chatetomium globosum,* was studied by macroscopic and microscopic examination in the presence and absence of degreased, steam-sterilized wool fabric using the following liquid media: Czapek's, Czapek's without sucrose, Czapek's without $NaNO_3$, and Czapek's with both sucrose and $NaNO_3$ omitted. The same media were used in the solid form by adding agar to the various liquids. Distilled water and water agar were used as controls. Also the effect of adding an aqueous wool extract to the various liquid media was determined.

Czapek's solution and Czapek's agar supported from good to excellent growth of the four organisms. In general there was considerably less development in the incomplete Czapek's substrates than in the full Czapek's solution or agar but more than on the water agar. The latter supported either no growth or scant to fair growth. In distilled water, the micro-organisms did not grow except in the case of *C. globosum.*

The four test organisms grew when the wool fabric or the wool extract was added to distilled water. The addition of wool fabric to Czapek's and the incomplete solutions stimulated the development of each organism in each media at some time during the incubation period. Also the presence of the wool extract enhanced the growth of each organism in Czapek's and the incomplete solutions.

When the wool fabric was added to the solid media, microscopic examination revealed a stimulation of growth at the ends of the cut fibers on all media inoculated with *B. mesentericus* and *B. subtilis* indicating diffusion of nutrients from the cut ends. Because of the preferential development of *C. globosum* and *A. albus* on the fabric, the stimulation at the ends of the fibers was not very apparent in these cases.

Degreased, steam-sterilized wool, in the absence of added nutrients, was resistant to attack by three of the test organisms, namely *B. mesentericus, B. subtilis,* and *A. albus.* Under the conditions of these experiments only one organism, *C. globosum,* grew on the wool in the presence of distilled water alone. However, this growth was limited, being only fair at the end of the incubation period.

A. albus grew on the wool in the presence of Czapek's and the incomplete Czapek's media and water agar and was the most active of the organisms in disintegrating wool fiber. Only in the presence of distilled water did this organism fail to grow or cause fiber damage. *C. globosum* grew on all the solid and liquid media and the controls but disintegrated the fiber less than *A. albus*. Only on Czapek's solution or agar did *B. subtilis* grow on wool and cause considerable fiber injury. *B. mesentericus* grew on the wool only on Czapek's agar in the test tube experiment and caused but slight fiber deterioration.

Wool fiber is relatively resistant to the four test organisms. However, the soluble products resulting from the hydrolysis of wool are readily utilized by these organisms. The extent of fiber disintegration is influenced by the type of organism and the presence of added nutrients.

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THE LIFE OF JOHN MERCER*

THE Society of Dyers and Colourists (England) heard the first of an annual series of lectures endowed by an anonymous donor as a monument to the discoveries of John Mercer in Manchester on May 19.

The lecturers, N. G. McCulloch and I. S. Harrison (both of Calico Printers' Association Ltd.), and other speakers dealt in this first lecture mainly with the life of John Mercer, drawing some conclusions for present problems from the example of John Mercer's own efforts in the early part of the nineteenth century. Many intermediate generations appear at times to have forgotten the craft, technical and scientific bases for their commercial success, which had been laid in hard conditions by their predecessors.

Mercer started his industrial career when 9 years old, as a bobbin winder, becoming in a few years a hand-loom weaver. He became interested in dyeing and printing, decided to become a dyer, and in 1809 was apprenticed to Messrs. Fort, Oakenshaw Print Works, Blackburn. He was a good workman and a good student, of inquisitive mind—not very popular with the foreman—and was paid off when trade became bad. He had married in 1813 and he started in a small business of his own. His first known invention was in 1817, the development of an orange shade on cotton fabric by padding the cloth in a solution of antimony sulfide in sodium sulfite, followed by a passage through weak sulfuric acid. Resulting from this discovery, his former employer, Mr. Fort, of Oakenshaw Print Works, offered him the job of experimental chemist at a starting salary of thirty shillings per week. From 1825-48 he was a partner in the business which prospered during that time. He left the Print Works in 1848, and from then to his death in 1866 he was occupied in discoveries and developments in calico printing, and, most important of all, in the treatment of cotton with caustic soda, and treatments of cotton.

Amongst his various discoveries should be mentioned the "blue-print" photographic process for duplication of machine drawings, the production of sulfated castor oil—that is turkey red oil, the forerunner of wetting agents. Another invention was a method of locally discharging indigo-dyed cloth to produce a white design on a blue background. Mercer was the first to chlorinate wool which he did by passing it through a solution of bleaching powder and hydrochloric acid; the aim was to improve dyeing affinity, the unshrinkable effect was not mentioned.

His wide viewpoint is exemplified by his researches in the field of pharmacy, and he devised and improved several medical preparations, and was the first to suggest that disease was caused by germs; this being many years before the work of Pasteur or Koch. In 1852 he was honored by election as a Fellow of the Royal Society, which was a high recognition of Mercer as a scientist.

He had noticed that cotton fabric used for filtering strong caustic soda solution became almost transparent by swelling of the cotton hairs, that the cloth contracted, and that the material could be dyed more readily as a result of the treatment.

Mercerization, or the method of obtaining luster on cotton, by resisting the shrinkage of suitable cotton yarns (and suitable cotton) treated with strong caustic soda, was discovered by Horace Lowe in 1890.

After investigations, Mercer found that other substances such as strong sulfuric acid also caused shrinkage. He patented the treatments in 1850, and showed how local parchmentizing effects could be produced by local application of caustic soda solution or sulfuric acid. Portions of cloth were protected from the action of the alkali or acid by printing gum arabic or gum senegal on to the cloth prior to the mercerizing treatment. In this way he produced crepon, or puckered effects. A French company offered Mercer £40,000 for the patent rights, but he refused. The commercial development of the process was retarded by the high cost—and low production at that time—of caustic soda or potash.

In addition to the treatment of cotton fabrics to produce what he termed a "fulled" cloth, he also applied the mercerizing process to yarns. He produced tough parchmentized paper by a treatment with strong sulfuric acid, and vulcanized fiber by zinc chloride treatment.

* Reprinted from the Textile Manufacturer, June, 1944.

He showed that a chemical compound was formed between the cotton cellulose and caustic. The knowledge of alkali-cellulose prepared the way for the discovery of viscose rayon. Mercer's work on the solubility of cotton cellulose in cuprammonium solvent also provided information which later was of value when the viscose rayon and cuprammonium rayon processes were being evolved.

A full account of the career of Mercer is given in the book "The Life and Labors of John Mercer, the Self-taught Chemical Philosopher," by Edward Parnell (Longmans Green & Co., Ltd., London, 1886).

Dr. Cronshaw, presiding, said the life of Mercer showed that it was possible to be in industry and yet make a considerable contribution to knowledge.

"SCIENCE IN AN OLD INDUSTRY"

Mr. McCulloch, reading the paper of the two lecturers, said Mercer made one of the outstanding discoveries in the textile industry. His work had led to a great many discoveries, but there was no finality. Thus he did not develop his researches to the point of achieving the luster which is commercially the more valuable aspect of mercerization. That did not come until forty years later. It was not unusual for the efforts of genius to open up areas available to able but less gifted minds.

The knowledge won by Mercer was adopted by the industry, which, however, was not permeated by Mercer's scientific outlook. Science was neglected by the conservative minds of the industry and interest in it was only revived when the great German dyestuffs firms made available to dyers the benefit of scientific work done on the basis of Perkin's discovery of aniline dyestuffs. Thus the dyers found they could benefit from scientific work without themselves employing scientists. Possibly that delayed the pursuit of research by the industry itself, but at least a certain amount of progress was made before the last war.

What the industry mainly depended on for its pre-eminence in those days was its experience, craftsmanship and good quality of work based on previous investigation such as Mercer's. It is difficult for the industrial craftsman and the scientist to understand each other, yet their co-operation could yield most fruitful results. A liaison officer might be of partial service but only an understanding of the actual work by the scientific side and a scientific outlook throughout the industry could translate the result of investigations into the industry so that the industry could build them into its methods and its products. It followed that at least some research should be done in all firms—even the small ones.

After all, a discovery is largely a matter of unindividual or individuals, and in that aspect could come as readily from a small firm as from a large one.

Research carried out in daily contact with prduction and its problems has considerable advantages and stimulus. Moreover, it allows the application of any development to the machinery of production to be brought about in a minimum of time. A well-trained mind can receive a considerable urge when brought into contact with the problems of industrial activity. There is also a stronger tendency to economic work in research done privately. We must have university research and industrial research associations, requiring wide efforts and large amounts of money, but the results could only be brought to fruition by the efforts of an industry itself full of mental alertness and curiosity. Facing the formidable problems of the present and future it should be recognized that salvation can come in many different ways, and all ways should be left open.

An example was the development of rayon production by Courtaulds Ltd. Many attempts by larger firms had failed. In the textile industry Courtaulds Ltd. were then relatively a small firm, but they were not deterred and they won through. We are at a stage where we cannot afford to neglect science, and we neglect at our peril the risks of not following the example of small firms or of individuals like Mercer.

Nationally we are going to face a most difficult struggle to maintain our people in full employment and maintain our standard of life. We have much to learn from the U. S. A. and from Russia in translating the results of scientific thought from the laboratory to the industry. Technological training has been the Cinderella of education in this country. It is not so in America or Russia. We should have a university of technology. We have had great scientific leaders, but nowhere a clear dedication to the practical needs of the community. Manchester would be a good center. This need of technicians in industry is one of the lessons of the life of John Mercer, a leader of industry who was also a great scientist.

TRADE NOTES • NEW PRODUCTS

OBITUARY

FLOYD H. COUCHMAN

FLOYD H. COUCHMAN, Boston manager of American Aniline Products, Inc., died July 30, 1944. Employed in the Boston district for ten years, he was well and favorably known throughout the trade. The funeral was held Wednesday, August 2nd, from the Lyons Funeral Home, Washington St., West Newton, Mass.

FRANK GRISWOLD HALL

FRANK GRISWOLD HALL, a pioneer in the industrial development of Starch and Adhesives and well known in Import circles, died at Mary Hitchcock Hospital, Hanover, N. H. on July 30th as a result of an automobile accident. Born seventy-three years ago in Florence, Massachusetts, Mr. Hall took a position with the partnership of Stein, Hirsch & Company, predecessor of Stein, Hall & Company, Inc., New York, as office boy in 1890. Before long he was made a partner in the firm and in 1918 became President of Stein, Hall & Company, Inc., a post held until the time of his death. He was also President of The Stein-Davies Company, Long Island City; Stein, Hall Mfg. Co., Chicago, and Stein-Hall Ltd., Toronto, and in 1920 founded the Hall Trading Corp., Rotterdam, a foreign subsidiary. Surviving are his widow and four daughters.

DR. EDWARD BAUSCH

EDWARD BAUSCH, chairman of the Bausch & Lomb Optical Company, died at his home in Rochester, New York, July 30, at the age of eighty-nine.

Mr. Bausch was a native of Rochester, the eldest son of John Jacob Bausch, who established the Bausch & Lomb Company in partnership with Captain Henry Lomb in 1856. He left Cornell University after three years of study and entered his father's company in 1874, at which time the company began the manufacture of microscopes. He became vice-president of the firm in 1899 and was elected president in 1926 to fill the vacancy caused by the death of his father. During World War I, he and a brother, William Bausch, set up a plant in Rochester for making precision optical glass, one of the critical military materials of the war.

In 1940 he and his wife, the late Matilda Morell Bausch, presented their home to the City of Rochester for the Rochester Museum of Arts and Sciences, and built a new building for the museum at a cost of $521,000. Mrs. Bausch died July 14, 1940. Surviving is his brother, William.

EDGAR HIEL BRISTOL

EDGAR H. BRISTOL, President of The Foxboro Company, of Foxboro, Mass., and one of its founders, died unexpectedly

of a heart attack on July 24, at his summer home at Falmouth Heights, Mass.

Mr. Bristol was born in Naugatuck, Conn., March 7, 1871. He had unusual mechanical skill, and after completing his high school education he found employment as a machinist, later becoming a tool-maker and subsequently production manager of the instrument company of which his father was president. With his brother, Bennet B. Bristol, he withdrew in 1908 to organize the Industrial Instrument Company which, on January 1, 1914, became The Foxboro Company. Mr. Bristol maintained an active participation in the company's affairs, serving as its president throughout its history.

More than forty patents were recorded to his credit, some of them so basic in character as to establish new principles of instrument design and operation. The helical spring, which is the measuring element in temperature and pressure recorders, is an example of his inventive genius.

He is survived by his widow, a son, Benjamin H. Bristol, and four daughters.

• APPOINTED SALES REPRESENTATIVE

Smith, Drum & Company announce that Albert P. March has become associated with them in their textile machinery division as sales representative.

Albert P. March

Mr. March graduated from the Philadelphia Textile School in 1923, and is a member of Phi-Psi Fraternity. For a number of years after graduation he was chemist and dyer in various plants throughout Pennsylvania. Later he became associated with the Philadelphia office of National Aniline and Chemical Co. in the Sales and Technical Service Division.

• ANODES BEING FLOWN TO CHINA

Graphite anodes are now being flown over the Himalayas to Chungking from railheads in India to keep China's chlorine and caustic soda industry operating at full capacity, it is stated by National Carbon Co.

Supplied by National Carbon Company, Inc., the anodes are shipped to railheads in India and are then flown to Chungking.

China's first chlorine and caustic soda plant, and until recently its only one, was set up in Shanghai in 1929. As it was the only unit in China, prodigious efforts were required to keep it from falling into the hands of the Japanese when they took Shanghai.

It was dismantled and the most irreplacable units transported by river sampan and coolie-back to Chungking, where it was re-assembled.

Shipments of anodes from this country has enabled the plant to remain in continuous operation since it was rebuilt at Chungking.

• MONSANTO PROMOTION

The promotion of Walter P. Konrad from the Phosphate sales department in St. Louis to branch manager of the Phosphate division sales department in Chicago was announced today by Robert S. Weatherly, general manager of sales of the Phosphate division. He will take over his new duties on August 1.

Mr. Konrad graduated from Indiana University in 1922. In 1925 he joined the sales force of the Provident Chemical Company, a property of Swann Chemical Corporation which was absorbed by Monsanto in 1935. Since that time he has been in the Phosphate sales group in St. Louis.

• SYMPOSIUM ON THE APPLICATIONS OF SYNTHETIC RUBBERS

The purpose of this symposium developed for A.S.T.M. Committee D-11 on Rubber Products, by a special committee headed by Arthur W. Carpenter, is to meet the present need for authentic technical information on the uses of various synthetic rubbers. The publication is considered timely because of the rapid increase in the use of synthetic rubbers in many fields, and the lack of a compilation of data on their efficiency and serviceability in these fields. Some of the country's outstanding authorities presented technical papers and discussion. Following papers on the origin and development of synthetic rubbers (Fisher); physical testing (Cooper); there is a comprehensive discussion on physical properties (Ball and Maassen); specifications (De France); and an interesting evaluation of processing characteristics and the use of synthetic rubbers in the manufacture of extruded products (A. E. Juve).

Then follows a series of papers covering specific applications, including rubber tires and inner tubes (Torrance); belting and hose (White); molded products (Sanger); cellular rubbers (Gould); hard rubber products (W. H. Juve); use in the wire and cable industry (Schatzel); footwear (Glover); and adhesives (Wehmer).

Copies of this 140-page publication, which includes a large number of charts, tables, etc., can be obtained from A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia 2, Pa., at $1.75 (cloth binding) or $1.50 (paper binding).

• QUARTER CENTURY CLUB

National Starch Products, Inc. (National Adhesives) now has 34 employees, including officers, in its Quarter Century Club, which is comprised of those with 25 or more years of continuous service to their credit.

This information was revealed recently when National awarded Service Pins to all employees with the company 5 years or more at their New York, Philadelphia and Boston offices, as well as at their Eastern plant in Dunellen, and Midwestern Division in Chicago. Similar awards are scheduled for their Indianapolis plant and West Coast Division in San Francisco.

Service Pins of the Quarter Century Club are of gold and mount a diamond, whereas 20 year pins feature a ruby and 15 year pins a pearl. Pins for 10 years of service are solid gold and 5 year pins, sterling silver.

• ELECTED PRESIDENT

William J. Priestley has been elected President of Electro Metallurgical Company, Electro Metallurgical Company of Canada, Ltd., Michigan Northern Power Company, and Union Carbide Company of Canada, Ltd., Units of Union Carbide and Carbon Corporation. Mr. Priestley succeeds the late Francis P. Gormely.

William J. Priestley

Mr. Priestley was graduated from Lehigh University in 1908 with a degree in metallurgical engineering, and entered the employ of Bethlehem Steel Corporation. He became superintendent of the armor plate plant and was subsequently division superintendent in charge of all ordnance production for that company. During World War I, he entered Government service and became the civilian head of

the Armor Plate and Ordnance Plant erected by the United States Navy. Later, Mr. Priestley managed a steel plant making high-grade alloy steels for the automotive industry.

In 1923 Mr. Priestley became consulting metallurgist for Electro Metallurgical Company. He became Vice-President in charge of Sales Development in 1932. Mr. Priestley was chief of the Alloy Steel Division of the War Production Board during the period of organization for the expansion of alloy steel production in 1942.

Throughout his business career, Mr. Priestley has taken a leading part in extending the uses of stainless and alloy steels.

● **AWARDED THIRD STAR**

Hooker Electrochemical Company of Niagara Falls, N. Y. has been awarded a third star for their Army-Navy "E" Flag, in recognition of their continued excellence in the production of materials for the War Department.

● **PARTIAL CONVERSION OF COTTON LOOMS**

To meet heavy military requirements for tenting materials, and increasing demands for essential civilian fabrics, the War Production Board recently ordered a partial conversion of cotton looms operating on bed spread fabrics, drapery, upholstery, pile fabrics, table damask and colored yarn suitings to the production of ducks and duck substitutes for military orders, as well as fabrics urgently needed in the civilian economy.

The action was taken in amendments to Limitation Order L-99, which controls operations of spinning machinery and looms producing cotton textiles.

Other amendments to the order expand conversion of looms operating on drills, twills and sateens to the production of tent twills, and permit the producer to make either tent twills or duck substitutes.

In addition, to meet military procurements, weavers of corduroys are directed to divert 40 per cent of their yarn production to the manufacture of duck, duck substitutes or jungle cloth. To meet this program additional looms also are converted from tickings to the production of ducks or duck substitutes.

The order, as amended, freezes all looms weaving carded yarn fabrics, either gray or colored, into relatively narrow categories. Formerly colored yarn looms were not under control. All appeals granted previously to produce fabrics other than those permitted by the order are revoked by the amendment.

The order also prohibits the operation of any newly-acquired cotton textile machinery except as authorized by WPB, and stipulation is made of the data to be submitted in applying for such authorization. The conversion of these looms must be completed by September 1, 1944, WPB said.

● **"ALKYL AMINES" UNDER QUARTERLY ALLOCATION**

Monomethyl amine and dimethyl amine, the "alkyl amines" used in the manufacture of dyestuffs, explosives, photographic chemicals, detergents, bactericides, rubber accelerators, pharmaceuticals and pesticides, will be placed under quarterly allocation as a schedule of General Allocation Order M-300, effective October 1, the Chemicals Bureau of the War Production Board reported recently. Their distribution has been controlled by directive for the last six months.

Chemicals Bureau officials said that the military demand exceeds production capacity so much that it is probable that all civilian uses will be denied for the next six months.

By terms of the amendment to M-300, a small order exemption without use certificate of 1,000 pounds of monomethyl amine and 1,000 pounds of dimethyl amine per person per quarter is established.

Suppliers seeking authorizations to use or deliver must file application on Form WPB-2947 by the 15th of the month preceding the proposed allocation quarter. Separate sets of forms are required for each alkyl amine.

● **HERCULES APPOINTMENTS**

Clark B. Kingery, assistant manager of Hercules Powder Company's Parlin, N. J., chemical plant, has been named manager of the Cellulose Products Department plant just established at Hopewell, Va., it was announced recently.

W. Ernest Henry will continue as manager of the chemical cotton plant at the same location.

Mr. Henry has been associated with the chemical cotton industry since the last World War. He has been at the Hopewell plant continuously since 1920 and in charge of the plant's operations since August, 1939. Hercules acquired the plant from the Virginia Cellulose Company in 1926.

Mr. Kingery will assume a position created by a proposed 60 per cent expansion in the ethyl cellulose manufacturing facilities at Hopewell. Included in this expansion, which was brought about by increased demands from the Army and Navy, will be the construction of an ethyl chloride production unit for the conversion of by-product materials of the ethyl cellulose plant.

Date of completion of the plant will depend upon how rapidly materials are made available.

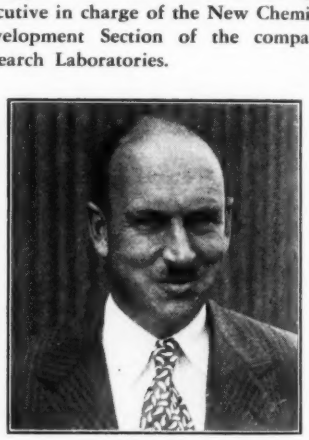
● **RESEARCH SUPERVISOR OF DU PONT**

Lawrence B. Steele, Jr., research chemist in the Acetate Research Section of the Du Pont Company, at Waynesboro, Virginia, has been named research supervisor in the same section. He will supervise work on problems related to high-tenacity rayon yarn.

Mr. Steele, a native of Georgetown, South Carolina, was graduated from The Citadel, at Charleston, and took graduate work at the University of Tennessee. He joined the Du Pont Company in September, 1933, as an operator in the semi-works plant at Waynesboro and was appointed a research chemist the following year.

● **GENERAL MILLS APPOINTMENT**

A. D. Hyde, Vice President of General Mills, in charge of research, announced the appointment of Almon G. Hovey as executive in charge of the New Chemicals Development Section of the company's Research Laboratories.



Almon G. Hovey

Mr. Hovey joins the General Mills staff with a background of 20 years experience in the field of synthetic resins. During this time, with the exception of one year with the Remington Arms Company of Bridgeport, Conn., where he did analytical testing and development work on raw materials, his entire attention has been directed toward the many phases of this field, including research, development, production, servicing, advertising, and patents.

● **CHEMICAL INDUSTRY MEDAL AWARD**

Col. Bradley Dewey has been selected to receive the Chemical Industry Medal for 1944. This award is made annually by the American Section of the Society of Chemical Industry and the candidate to receive the medal is selected by the Executive Committee which constitutes the Medal Committee. The award is being made to Col. Dewey for his work in colloid chemistry, especially as pertaining to rubber latex, and his accomplishments in

administering the synthetic rubber program during the critical war period.

• SOCIETY OF CHEMICAL INDUSTRY ELECTION

The American Section of the Society of Chemical Industry announces the election of Dr. Norman A. Shepard, Chemical Director of the American Cyanamid Company, as their chairman and Mr. Frank J. Curtis, Vice President of Monsanto Chemical Company, as vice chairman, to serve until July 1945.

Cyril S. Kimball and J. W. H. Randall were reelected Honorary Secretary and Honorary Treasurer, respectively. The following were elected as members of the Executive Committee: J. L. Bennett, P. K. Frolich, F. D. Snell, W. B. Wiegand and E. C. Williams.

• JOINS AMERICAN VISCOSE CORPORATION

George A. Johnson has joined the Textile Research Department of the American Viscose Corporation, located at Marcus Hook, Pa., it was announced recently. He is associated with the Knitting Division and will do research, development and field work, specializing to a large extent on circular knitting developments.

Mr. Johnson for the past 15 years has been connected with the North American Rayon Corporation at Elizabethton, Tenn., where he worked on the production and processing of rayon and for several years was manager of the corporation's subsidiary concern, Watauga Fabrics, which is engaged in the commercial production of knit fabrics.

• U. S. RUBBER CO. APPOINTMENT

Stanley W. MacKenzie has been appointed director of purchases of United States Rubber Company to succeed George M. Tisdale, recently elected a vice president and member of the executive committee of the company.

Mr. MacKenzie was made assistant to the director of purchases in 1941, which position he held until his present promotion.

• SECOND STAR AWARDED AMERICAN VISCOSE CORP.

The Marcus Hook, Pa., plant of the American Viscose Corporation has been awarded a second star for its Army-Navy "E" flag, which will be presented to the plant's employees in August. The plant is engaged in production of high-strength viscose rayon yarns for use in parachutes and tire fabric.

• U. S. LETTERS PATENT GRANTED

Celanese Corp. of America announced that Dr. Camille Dreyfus recently was granted United States Letters Patent No. 2,354,248 relating to wearing apparel provided with a lining which renders such apparel warmer and more resistant to wind.

In accordance with the invention, wearing apparel such as jackets, top coats, overcoats for either military or civilian use, is provided with a lining having a relatively thin film or foil comprising an organic derivative of cellulose such as cellulose acetate.

The garment provided with such a lining is said to have warmth-imparting properties and resistance to wind with only a slight increase in weight and substantially without any impairment of flexibility.

• RESIGNS FROM W.P.B.

Hugo Boeddinghaus resigned from the War Production Board, Textile, Clothing and Leather Bureau, on August 1, 1944. He will resume his duties with the American Felt Company as Vice President, and will be in charge of production and research.

• NEW ASBESTOS-FIBROUS GLASS CLOTH

A considerable increase in asbestos cloth production for major Navy requirements is expected as a result of a newly-developed asbestos-fibrous glass cloth, it was reported at the recent meeting of the Asbestos Textile Industry Advisory Committee, the War Production Board said recently.

Since increased Navy requirements for asbestos cloth have caused asbestos textiles to become a critical bottleneck in war production, officials of the Cork, Asbestos and Fibrous Glass Division said that the new cloth will reduce this bottleneck. Navy representatives at the meeting indicated that the fibrous glass cloth is satisfactory for pipe lagging, an important Navy need.

Industry members were informed that 240,000 square yards of asbestos-fibrous glass cloth will be required each month, incorporating 240,000 pounds of asbestos yarn. The fabric will be composed of 72 per cent asbestos fiber, 22 per cent glass fiber, and six per cent cotton yarn. This will be woven into three-ply cloth, weighing 1¼ pounds per square yard, and utilizing existing equipment of the asbestos textile manufacturers.

WPB officials, stressing the urgent need of this material for the Navy, said that unless present producers can double their output by the use of the asbestos-glass cloth process, it would be necessary to erect a new plant in a labor-free area to cope with the problem.

It was pointed out that this new process could double the yardage of glass-asbestos cloth, while using the same amount of asbestos yarn as at present.

• ELECTED PRESIDENT HAYNES STELLITE COMPANY

E. E. LeVan has been elected President of Haynes Stellite Company, a Unit of Union Carbide and Carbon Corporation, succeeding the late Francis P. Gormely.

E. E. LeVan

Mr. LeVan, a graduate of Pennsylvania State College, entered the employ of Haynes Stellite Company as a sales engineer in 1922, becoming Chief Engineer three years later. In 1927 Mr. LeVan entered the Sales Department, and in 1929 became General Sales Manager. He was elected Vice-President in 1939, and on May 22, 1944, was made Vice-President and General Manager, and a director of Haynes Stellite Company. Mr. LeVan will continue to make his headquarters at Kokomo, Indiana, where the general offices and plant of Haynes Stellite Company are located.

• CLASS B AND C DYESTUFF QUARTERLY QUOTAS CUT 2½%

A new amendment to the dyestuffs and organic pigments order, M-103, reduces the quotas of class B and C dyestuffs that producers may deliver in any calendar quarter, based on the amounts delivered in 1941, from 17½ per cent to 15 per cent. There are no changes in such quotas for class D dyestuffs.

It is specified in the amendment that WPB may authorize the delivery and acceptance of additional quantities of all categories to be used as specifically directed and that authorizations for dyestuffs to be used in dyeing apparel for export may be granted when the dyestuffs will be used to fill contracts or subcontracts of a Government agency or for other essential export uses.

The amendment deletes yellow 3RD from list of A technical names and indanthrene yellow RRD from the trade names list. Amanthrene dark olive B and amanthrene khaki 2G Pr. 122 have been added to the latter.

The amount of dyestuffs that may be exported or delivered outside of the United States or Canada in any quarter,

excepting military orders and for other Government purposes, is as follows:

Class A dyestuffs, one-half of 1 per cent of the total value of all class A dyestuffs delivered by the producer in 1941.

Class B dyestuffs, 1 per cent of the total of all class B dyestuffs delivered by the producer in 1941.

Class C dyestuffs, three-quarters of 1 per cent of the total value of all class C dyestuffs delivered by the producer in 1941.

The order is amended to provide that for redyeing used apparel and household furnishings, no person in any quarter shall accept delivery of any class B, C or D dyestuffs for use in the United States or Canada in excess of the following quantities:

Class B, 25 per cent of combined amount of class A and B dyestuffs received from all sources in 1941, plus 250 pounds.

Class C, 25 per cent of value of class C dyestuffs received from all sources in 1941, plus $250 value.

Class D, 25 per cent of value of class D dyestuffs received from all sources in 1941, plus $250 value.

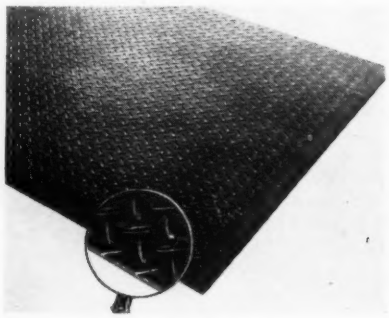
● QUESTIONNAIRE, SUB-COMMITTEE B-4

A short while ago questionnaires were sent to members of sub-committee B-4 (Bleaching, Dyeing and Finishing) of Committee D-13 of the American Society for Testing Materials to ascertain just what types of work the different members were interested in. Out of 87 questionnaires submitted, 54 answers were received. It is expected that the information obtained therefrom will be of great help in the formation of committees and in the actual work involved.

J. Robert Bonnar, acting chairman of sub-committee B-4, has tabulated the information obtained from the questionnaire and it is shown in the accompanying table.

● NEW TYPE PLASTIC MAT

A new type of matting for use in many places where rubber matting was formerly used has just been made available by American Mat Corporation, 1799 Adams Street, Toledo 2, Ohio.



Plastic Mat

This product which is being marketed under the name of Ameritred, is a solid plastic friction type mat made by firmly binding friction compound together by a plastic. It is ideal for use in building entrances, lavatories, shower and locker rooms, as hall runners, stair treads and landing mats, on ramps, in front or back of counters, and for covering worn spots on floors.

It lies flat and affords a non-slip surface. By keeping feet off cold floors and reducing fatigue it increases efficiency and production. It promotes sanitation, good scrapeage providing easy removal of dirt from traffic. A factor in reducing breakage also is afforded.

● NEW KRON SCALE CATALOG

A new catalog of Kron Scales made by Yale is now ready for distribution. This catalog presents the full story of the entire Kron Scale line from dormant and portable platform types of special counting, batching, tensile strength and dynamometer models. Fully illustrated with complete specifications and dimensions of every standard Kron Scale, it is a valuable reference book.

The Yale & Towne Manufacturing Company, makers of Kron Scales, will be glad to send this catalog to any executive interested in increasing the efficiency of his own materials handling program through the use of precision industrial scales. Address your request to The Yale & Towne Manufacturing Company, Philadelphia Division, 4530 Tacony Street, Philadelphia 24, Pa., and ask for catalog R-44 which will be mailed to you at no obligation.

● ENGINEERING SERVICE DEPARTMENT EXPANDED

The Electrode Service Engineering Department of National Carbon Company, Inc., has been reorganized and enlarged, according to a company announcement. An increased number of technical advisers have been assigned to act as field consultants on the proper application techniques, the efficient use, and the development and improvement of carbon and graphite electrodes in electrometallurgical and electrochemical applications.

The company announcement stated that T. L. Nelson is in charge of the enlarged department, which will consist of two divisions. Dr. Neal J. Johnson has been named to head the department's electrolytic service division, and Dr. Charles H. Chappell is in charge of the electrothermic service division.

ANSWERS TO QUESTIONNAIRE, ASTM COMMITTEE D-13, SUBCOMMITTEE B-4

	1st Choice	*2nd Choice*	*3rd Choice*	*4th Choice*	*5th Choice*	*6th Choice*	*7th Choice*	*8th Choice*	*9th Choice*
1. Accelerated Ageing Tests for Cotton	12 (12)	13 (4)	9 (3)	1 (0)	3 (0)	2 (1)	4 (2)	5 (2)	3 (2)
2. Resistance of Textiles to Insect Pests	11 (10)	3 (2)	6 (1)	6 (4)	7 (1)	5 (0)	2 (0)	6 (1)	2 (0)
3. Resistance of Textiles to Micro Organisms	25 (18)	6 (4)	7 (2)	6 (4)	3 (3)	..	4 (0)	2 (1)	2 (2)
4. Identification of Textile Finishes	15 (12)	8 (8)	6 (3)	5 (3)	7 (5)	7 (3)	1 (0)	1 (0)	1 (1)
5. Water Resistance of Textile Fabrics	23 (20)	11 (8)	10 (7)	4 (1)	5 (1)	4 (3)	1 (1)	..	..
6. Fastness to Washing and Laundering	18 (16)	10 (8)	12 (9)	5 (3)	4 (4)	2 (1)	3 (2)	1 (1)	1 (0)
7. Resistance to Fire	6 (4)	11 (7)	9 (6)	7 (7)	3 (2)	4 (3)	4 (3)	4 (2)	..
8. Determination of Copper Content	3 (2)	2 (1)	13 (9)	4 (4)	3 (2)	3 (2)	2 (1)	3 (1)	11 (10)
9. Light Fastness	16 (14)	8 (7)	6 (4)	4 (3)	5 (5)	2 (0)	3 (0)	2 (0)	4 (0)

Figures in parenthesis indicate number available for laboratory work.

Invisible Quality
Most AHCO PRODUCTS for
finishing textiles, fall in
category. Yet they are just as important
to a garment as color, style and
the drape, the body, the
the washability, the
or the resistance to
all serve to build a reputation for
the mill, the finisher and the
manufacturer.
That AHCO PRODUCTS do their job
well is evidenced by the fact that
they have been used in steadily
increasing quantities for 129 years.
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Established 1815. Plants at Dighton, Mass.
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AHCO PRODUCTS

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The Pioneer Concentrated Cotton Warp Size for Better Weaving

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Makes better warps from synthetics

AHCOWET
An outstanding wetting agent for sanforizing and other types of finishing

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Keeps colors clear and bright

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Gives added softness and drape to cottons and synthetics

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For extra body, fullness and softness — cottons and synthetics

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Safety lies in the adoption of the use of Logwood as standard procedure in dyeing fast blacks, since you have these advantages:

1. Beautiful lustrous blacks of real intensity and perfectly fast to light.

2. Perfect coverage and penetration . . . no carbonizing or speck dyeing needed.

3. A 3% to 5% increase in weight.

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LOGWOOD
first choice for fast blacks

For Tensionless Processing
OF MODERN FABRICS USE VAN VLAANDEREN MACHINES

VAN VLAANDEREN TENSIONLESS JIG
is a key machine in the Van Vlaanderen line. Fabrics are guarded against harmful tension while tautness is maintained to prevent wrinkles and creases from forming during the dyeing process.

With more than two score years of experience, first with silk and then with fabrics made from other kinds of fine fibers, Van Vlaanderen designers have produced a complete line of machines for tensionless processing.

1. **Machines with features for tensionless operation that make for superior quality.**
2. **Mechanical excellence that reduces maintenance and assures efficient operation.**
3. **Exceptionally sturdy construction for long use under today's strenuous production schedules.**

Included in the Van Vlaanderen Line of tensionless machines are: Dyeing Machines, Tubers, Continuous Boil Off Machine, Drying Machine, Decatizing Machines, etc.

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World's Largest Manufacturers of Synthetic Fabric Processing Machines
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Manufacturers of Dyestuffs and Chemical Specialties

We offer to the Textile and Allied Trades a full line of

DYESTUFFS DYEWOODS
CHEMICAL SPECIALTIES

PENETRATORS AND WETTING AGENTS
SULPHONATED OILS AND SOAPS
WATERPROOFING AND FLAMEPROOFING AGENTS
PERMANENT FINISHES AND SOFTENERS
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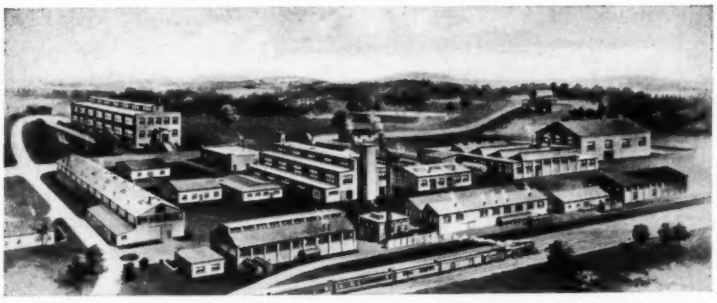
TEXTILE CHEMICALS



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Continuous Runs of 15,000 Yds. to 33,000 Yds. Now Possible

Heretofore, in the printing of textiles, it has been necessary to stop the machine every 2400 to 3000 yards, to clean pigments from the doctor blades.

Lubricant D-6 Concentrate

lubricates and distributes the pigments so thoroughly and evenly that such frequent stops are no longer necessary. The minimum continuous yardage that has been run, using this lubricant, is 15,000 while the maximum is 33,000. Result — increased printing production and reduced maintenance cost.

Originally developed for one of America's leading textile printers, Lubricant D-6 Concentrate is now offered to the printing industry as a tried and proved product, — already used on well over a million yards.

Write for Bulletin D.M.

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Kali TEXTILE CHEMICALS

For Better Penetration Use—

AQUAKAL* **No. 73** with ducks for quicker wetting out for mineral or vat dyes; with piece goods, skeins, packages or raw stock for wetting out.

RAYSPINOL* for cut staple.

SULPHONATED OILS for boil offs or scouring.

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DIASTAFOR de-sizing agent has been first choice of the textile industry for 36 years. This unmatched record of championship is due to Diastafor's superb quality and perfect performance. Fabrics treated with Diastafor are always supple, smooth and flawless—free from discoloration, injured fibres and impaired tensile strength.

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Diastafor Division of

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36 Years of Satisfactory Results

2 GOOD CHEMICALS FOR COTTON GOODS

V VIRGINIA

"VIRGINIA" (SODIUM) **HYDRO**

A dependable Hydrosulfite for Vat Dyeing and Stripping.

1. Crystalline, stable
2. Free-flowing; non-caking
3. Easily and Quickly soluble

Packed in 250 lb. *airtight* containers.

"VIRGINIA" (LIQUID) SO_2 THE IDEAL ANTICHLOR

The "Old Reliable" of the finishing plant. Low concentrations...

— remove active chlorine
— neutralize residual alkalinity
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Constant make-up by continuous flow to the pit. Shipped in steel cylinders containing 150 lb. net weight.

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increased resiliency
clearer stitch
greater output
with Laurel Rayon Oils

Your coning, winding, softening, knitting or weaving moves along with greater efficiency when you use Laurel Rayon Oils. Their protective film holds the fibers together; prevents abrasion or breakage during processing; strengthens and keeps yarns soft, supple, resilient, workable. Laurel Rayon Oils are highly penetrant. Quickly removed in regular scour. Do not oxidize or become rancid on standing. Easily applied on the coners or in packages.

Developed and tested by Laurel Laboratory—now in its thirty-sixth year—Laurel Rayon Oils can help you increase quality production, meet Government specifications. Available for immediate delivery. Don't risk costly processing errors. Use Laurel experience in textile application as hundreds of leading mills are doing. Send today for trial order and recommendations.

Laurel Rayon Size • Laurel Ruxite • Laurel Hydrosol
Laurel Boil-Off Oils • Laurel Textile Oils

★ *For Victory and Peace —buy extra War Bonds*

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Laurel SOAP MANUFACTURING CO • INC •
Wm. H. Bertolet's Sons • *Established 1909*
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WAREHOUSES: PATERSON, N. J. • CHATTANOOGA, TENN. • CHARLOTTE, N. C.

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A salute to the Coast Guard on its 154th anniversary! . . . oldest service in the nation serving with distinction in war as in peace . . . *a fighting unit true to the tradition of the boys in Navy Blue!*

Helpful in the preparation of true blue Azo dyes for Navy Blue is SOLVAY Sodium Nitrite. This pure, free-flowing crystal is especially suited for manufacturing dyes and for textile dyeing. For dyes that won't die—specify SOLVAY Sodium Nitrite—and be sure of the highest quality!

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SODIUM NITRITE

• Classified Advertisements •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

WANTED: A demonstrator-salesman for the textile specialties with experience in the textile processing to represent an old established but progressive manufacturer. Advise age, experience and qualifications. Box 573.

POSITION WANTED: I have a thorough knowledge of warp, skein, and package dyeing, all types of colors. Am anxious to locate a suitable job with a large dyehouse in the South. Employed at present but desire a change. Accustomed to handling one hundred thousand pounds per week, including mercerization. Married, have two children, draft status 1-A-H. Box No. 578.

WANTED: Chemists, by large and progressive textile dyeing, finishing and processing plant in the Middle Atlantic States. Openings for chemically trained men with and without experience. Excellent opportunities, permanent positions in both research and production work. State education, experience and salary expectations. Box No. 579.

WANTED: Chemist, thoroughly acquainted with the textile specialty field. Must have thorough knowledge of manufacture of detergents, sulfonated oils, finishing compounds and specialty products. Salary $6,500 for the right experienced man. Box 582.

MANUFACTURERS AGENT AVAILABLE: Reliable party would like dyestuff and textile chemical account in South on commission basis. Excellent contacts among southern dyeing and finishing trade. Familiar with application angle as well as sales. For details write Box 583.

POSITION WANTED: Superintendent. Fully capable of taking complete charge of mercerizing, dyeing, bleaching and winding of cotton in the skein, warp or package. Age 48, married, American. Box 584.

POSITION WANTED: Chemist. Female, graduate work in chemistry. Six years of experience in textile and mercantile testing, including three years as laboratory director, desires position with future offering opportunities for research. Box 585.

SALESMAN WANTED: For person with proper connections in cotton, rayon, and/or woolen finishing plants we will make any arrangements desired to sell our textile specialties. Established for over 50 years, we are anxious to acquire and willing to pay well for the services of a successful salesman capable of maintaining the prestige of our company and its products. Box 586.

POSITION WANTED: Dyer, 33 years old, 14 years experience, cotton, rayon and acetate crepe piece goods. Draft exempt, can go anywhere. Box 587.

WANTED: MANUFACTURING CHEMIST: Manufacturer of textile chemical specialties situated in Metropolitan area offers an unusual opportunity for a man capable of supervising processing of present formulations, and to develop new ones. He must have a good knowledge of rayon textile printing gums, all types of finishes, detergents, etc. Only a man answering these qualifications will be considered. Box 588.

WANTED: Experienced chemist for development work in textile finishes, including printing materials, weatherproofing and special resin finishes. Must have good record of experience. Excellent opportunity and attractive salary for qualified man. State fully qualifications and experience. Our employees know of this advertisement. Write Box 589.

NOTE

Essential employees need release statement. Employees who are to be hired for critical occupations need release statement and U. S. E. S. consent.

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Copper, Zinc and Mercury Naphthenates — meeting all Government specifications—available in various concentrated forms for use in solvents or emulsions. Write for samples and use information.

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ELIZABETH, F, N. J.
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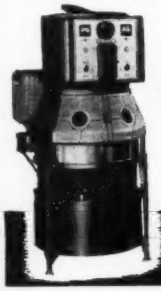
TEST TEXTILES for WEATHERING and FADING in the

ATLAS TWIN ARC WEATHER-OMETER

Faithfully duplicates the combined weathering effects of sunlight, rain, and heavy dew; accelerated to reduce years of actual weathering to a few days' testing. All weather cycles automatically controlled for continuous operation without attention.



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The recognized standard testing machine in the textile field for determining the fastness to light of dyestuffs and fabrics. Fully automatic in operation.

ATLAS ELECTRIC DEVICES CO.
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CHEMICAL SPECIALTIES *for the* TEXTILE INDUSTRY

"Always Reliable"

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QUALITY RICHMOND PRODUCTS

ROSALAMINE

The better Scouring and Dyeing Aid for Cottons, Rayons, etc.

Fine for "Boiling Out"
Two Types

Yellow, which contains an organic chrome compound for conserving dyestuff.
White—without chrome.

Complete Details upon request

At Your Service

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THE STANDARD DE-SIZING AGENT

RAPIDASE

Dependable, speedy and economical de-sizing . . . Our technical staff always at your service.

● *for cottons rayons and mixed goods*

WALLERSTEIN CO., INC.
180 MADISON AVENUE, NEW YORK

INDEX TO ADVERTISERS

Alrose Chemical Co. X
Althouse Chemical Co. ..... Second Cover
Amalgamated Chemical Co. ....
American Aniline Products, Inc. III
American Cyanamid & Chemical Corp. ..... Back Cover
American Dyewood Co. XXIV
American Viscose Corp. .....
Ansul Chemical Co. .....
Aqua-Sec Corp. .....
Aridye Corp. .....
Arkansas Company, Inc. XXXI
Arnold-Hoffman & Co., Inc. XXIII
Atlantic Chemical Co. .....
Atlas Electric Devices Co. XXIX
Becco Sales Corp. .....
Bick & Co., Inc. .....
Blickman, Inc., S. .....
Burkart-Schier Chemical Co. XXX
Butterworth & Sons Co., H. W. .....
Calco Chemical Division, American Cyanamid Co. .....
Campbell & Co., Inc., John IV
Carbide & Carbon Chemicals Corp. XIX
Carbic Color & Chemical Co., Inc. XX
Ciba Company, Inc. .....
Colgate-Palmolive-Peet Co. .....
Commonwealth Color & Chemical Co. XXV
Du Pont de Nemours & Co., Inc., E. I. .....
Dyestuffs Division ..... Front Cover
Electrochemicals Dept. .....
Grasselli Chemicals Dept. .....
Emery Industries, Inc. .....
Exact Weight Scale Co. .....
Fancourt & Co., W. F. VIII
Gardinol Corp. XIV
Geigy Company, Inc. .....
General Chemical Co. XVI
General Dyestuff Corp. VII
Givaudan-Virginia, Inc. .....
Glyco Products Co., Inc. .....
Hercules Powder Co. XVIII
Naval Stores Department .....
Hooker Electrochemical Co. XV
Houghton & Co., E. F. .....
Industrial Rayon Corp. .....
Kali Manufacturing Co. XXVI
Kelco Co. .....
Kilcommons Chemicals Corp. XXVI
Laurel Soap Mfg. Co., Inc. XXVII
Leatex Chemical Co. XXIX
Leeds & Northrup Co. .....
Mathieson Alkali Works, Inc. .....
Monsanto Chemical Co. .....
National Aniline Division, Allied Chemical & Dye Corp. XXII
National Carbon Co., Inc., Carbon Products Division .....
National Milling & Chemical Co. XXVI
National Oil Products Company IX
National Starch Products .....
New Jersey Zinc Co. .....
Nuodex Products Co., Inc. XXVIII
Nyanza Color & Chemical Co. XXV
Onyx Oil & Chemical Co. V
Pabst Sales Co. .....
Perkins & Son, B. F. XI
Philadelphia Quartz Co. .....
Procter & Gamble XII
Quaker Chemical Products Corp. .....
Refined Products Co. .....
Richmond Oil, Soap & Chemical Co., Inc. XXIX
Rohm & Haas Co. XXXII
Royce Chemical Co. .....
Sandoz Chemical Works .....
Scheller Bros., Inc. ..... Third Cover
Socony-Vacuum Oil Co., Inc. .....
Solvay Sales Corp. XXVII
Smith, Drum & Co. .....
Standard Brands, Inc. XXVI
Stein, Hall & Co., Inc. XVII
Tennessee Eastman Corp. XIII
Union Carbide & Carbon Corp. XIX
Van Vlaanderen Machine Co. XXIV
Virginia Smelting Co. XXVII
Wallerstein Co., Inc. XXIX
Warwick Chemical Co. .....
Westvaco Chlorine Products Corp. .....
Wolf & Co., Jacques .....
Young Aniline Works .....
Young Co., J. S. .....
Zinsser & Co. .....

Let LANITOL Do it

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SUPERIOR SYNTHETIC DETERGENT

A highly efficient product for use in scouring and boiling off all textile fibres. Active in hard or soft water it may be used alone in the bath or in conjunction with soaps or alkalies with amazing results.

- Let LANITOL increase the detergent action of your soap and achieve cleaner stock, yarn or cloth through its rapid and complete rinsing properties.
- Let LANITOL improve the boiling off, processing and dyeing of rayon hose in one or two bath methods. A better finish and uniform shade is easily accomplished.
- Let LANITOL prove its value for washing off worsted tops and yarn to remove all oil and grease.
- Let LANITOL demonstrate its ability to thoroughly scour rayon and woolen cloth and effectively remove all residual soap, dirt, etc. in the rinse, leaving the cloth with a pleasing hand and free from objectionable odors.
- Let LANITOL raise the efficiency of your fulling operation—a small addition to the soap liquor increases its penetration and activity when applied to the cloth in the mill and accelerates the fulling action.

Sample or demonstration furnished on request.

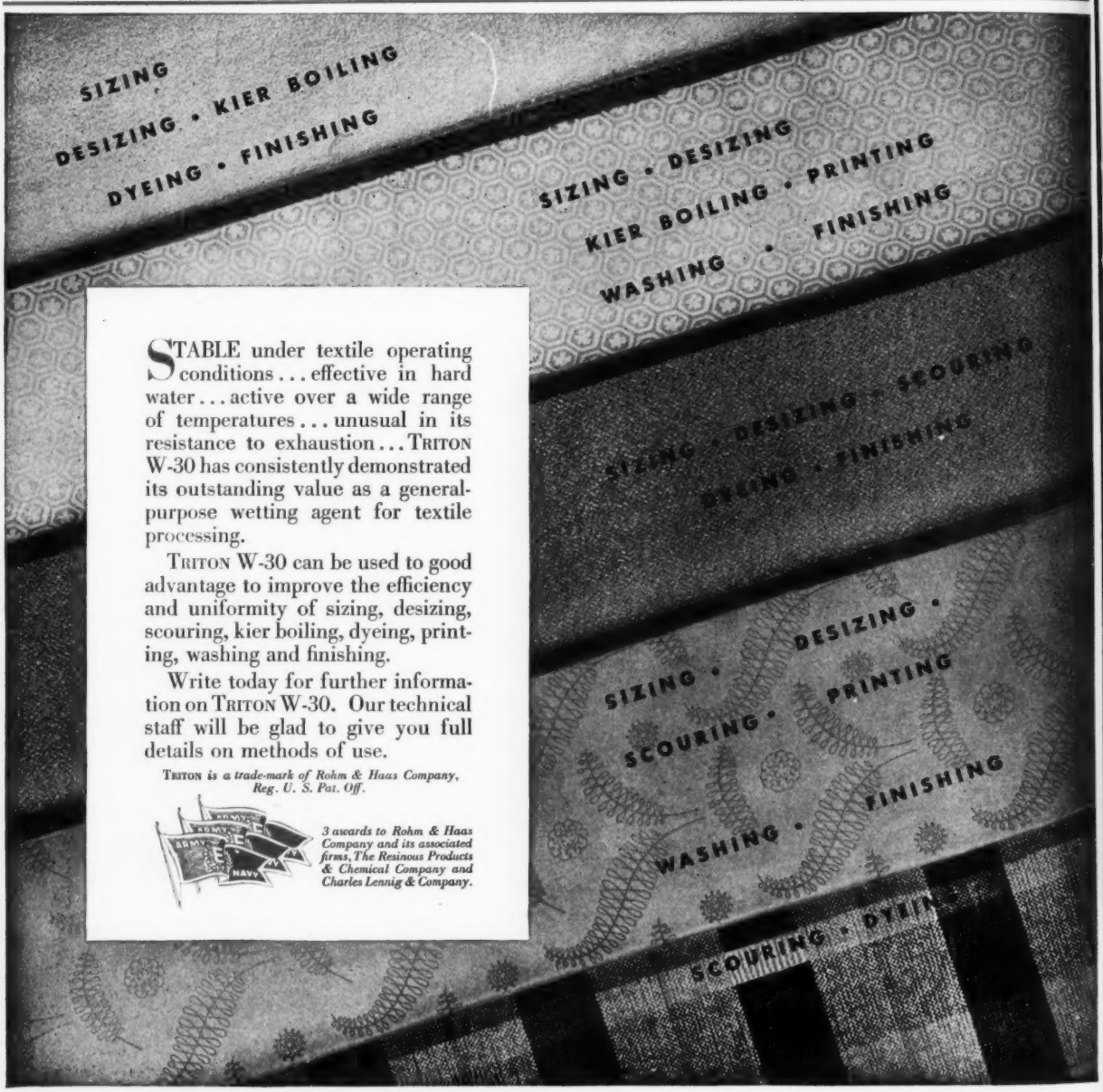
ARKANSAS CO., INC.

Newark, New Jersey

Manufacturers of Industrial Chemicals for over 40 Years

Time-tested leadership as an all-purpose surface-active material

TRITON W-30



STABLE under textile operating conditions . . . effective in hard water . . . active over a wide range of temperatures . . . unusual in its resistance to exhaustion . . . TRITON W-30 has consistently demonstrated its outstanding value as a general-purpose wetting agent for textile processing.

TRITON W-30 can be used to good advantage to improve the efficiency and uniformity of sizing, desizing, scouring, kier boiling, dyeing, printing, washing and finishing.

Write today for further information on TRITON W-30. Our technical staff will be glad to give you full details on methods of use.

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Tomorrow she'll say "I do"

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THE MOST POWERFUL WETTING AGENT AVAILABLE

CUTS TIME AND COSTS IN MORE THAN THIRTY DIFFERENT WETTING, EMULSIFYING AND DISPERSING OPERATIONS

Making one month do the work of two is a feat that has been accomplished over and over again by many textile mills through the use of DECERESOL OT. Here is a partial list of applications:

Wetting out cotton piece goods prior to "grey souring."

Wetting out raw cotton in raw stock dyeing machines.

As a penetrant in all types of dyeing including yarn and knitted and woven goods.

As a dispersing agent in the pigment method of vat dyeing.

For rapid wetting out in sanforizing.

For wetting out grey goods prior to kier boiling to insure more uniform boil off and to prevent resist marks in subsequent dyeing.

As a dispersing agent in dyestuff mixtures to insure better solubility and to improve color value.

As a dispersing agent for finishing oils to obtain greater softening value.

In desizing baths with enzymes to produce more rapid and efficient desizing.

For boiling off rayons and acetates.

In the woolen and worsted industry as an aid in fulling and carbonizing.

For dyeing Nylon and Vinyon yarns, hosiery, etc.

For the production of highly absorbent products such as mop yarns, paper mill felts, towels and similar fabrics.

Our representative will gladly give you more detailed information on the DECERESOL *Wetting Agents and help you select the type or types best suited to your operations.*

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